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ELECTRICAL REVIEW.

VOL. LXXIX. AUGUST 4, 1916. No. 2,019.

ELECTRICAL REVIEW.

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(J. A. Berly's).

1916 EDITION.

H. ALABASTER, GATEHOUSE & CO.,

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ELECTRICITY SUPPLY.

ELSEWHERE in this issue, by the courtesy of the Council of the Institution of Electrical Engineers, we are enabled not only to announce the *personnel* of the two committees appointed respectively by the Institution on the one hand, and by the Incorporated Municipal Electrical Association jointly with the Incorporated Association of Electric Power Companies on the other, to deal with the subject of the future of electricity supply in this country, but also to give some idea of the plan which they propose to adopt in order to prevent overlapping and to ensure effective co-operation. As we surmised when commenting on this subject some weeks ago, the Committees intend to divide the field of operations between them, and whilst keeping in close touch with one another, they will act on more or less independent lines. The Institution Committee will deal with the subject from the national point of view, while the joint Committee will concern itself with questions in their local aspect. Apparently the duties of the former will be to consider principles and methods, to confer with the Board of Trade on questions of policy, and to solve engineering problems, while the latter will be a committee of ways and means, and will investigate local conditions in the various areas concerned, with a view to expediting the accomplishment of the work of linking-up.

As an alternative the two bodies might have decided to hold joint sittings and combine their activities, but in all probability it would have been found necessary to appoint sub-committees with terms of reference very similar to those outlined above, so that in effect the same organisation would have been arrived at; and in case of need it will always be possible to hold joint sittings. It is interesting to note that out of the seven members of the I.E.E. Committee, no fewer than five belong also to the Joint Committee of twelve. In both committees the representatives of municipal and private enterprise are practically balanced; Mr. Chattock is the Chairman of the I.E.E. Committee, and Mr. Chamen, who combines municipal with company experience, presides over the Joint Committee. The selection of the membership in both cases leaves little room for criticism, and we have every reason to hope that their deliberations will be fruitful.

The attitude of the Board of Trade towards the primary object of the movement was further defined by Mr. Harcourt in reply to a question in the House of Commons, when he stated that the Board had not contemplated comprehensive schemes of interconnection involving heavy expenditure, but rather the linking-up of adjoining undertakings, where the difficulties to be overcome would be of minor importance. He indicated that, while special legislation for the purpose did not appear to be required, he was prepared to consider the question if necessary. This statement agrees with the impression we gained from the circular issued by the Board to all British supply undertakings. The difficulty which seems most likely to arise is in connection with the obtaining of wayleaves, an ever-present bone of contention in this country, which certainly demands consideration. If it were possible to secure compulsory wayleaves for public supply mains, whether overhead or underground, across private or public

property, on reasonable terms and at small cost, the situation would be transformed, and many useful schemes which have been hung up on this account would at once become practicable. Such legislation is urgently required, not only for the present purpose, but also for the due development of many undertakings quite apart from the new proposals.

The further proceedings of the Committees will be awaited with interest, and we trust that they will not fail to follow the excellent example already set by the Council of the Institution, and take the public into their confidence, as far as possible. When nothing is known of what is being done, the general impression is that nothing is being done, a view which in the light of past events is not without a measure of justification. But the door is closed upon the past; the Council of the Institution has adopted a new and active policy, and, we hope, a new era has dawned for the electrical industry in this country.

Private Supply of Electricity.

Those who essay to supply electricity to their neighbours otherwise than in accordance with the terms of a Provisional Order may have met with a series of difficulties. A correspondent has recently drawn our attention to his own case. Having established a small system of supply in his immediate neighbourhood, he has endeavoured to extend it to a town close by. He is opposed by a local gas company, who endeavour to prevent his carrying cables over their shareholders' property, and by the District Council, which refuses to allow the cable to be carried over highways under its control. We fear that there is nothing in any of the electric lighting Acts which will enable him to extend his system in these circumstances. It is quite true that wires may be laid over private property *by agreement*, and that, subject to the consent of the Board of Trade given pursuant to Sec. 4 of the Electric Lighting Act, 1888, they may, in certain cases, be laid over any street, but otherwise statutory powers must be sought. The Board of Trade have no power to sanction any invasion of private rights, whatever the motive of those who refuse to assent to the development of a scheme of supply.

Copper.

Developments in copper have been decidedly more interesting lately, although the progress of actual business has been very slow. The chief feature has been the spectacular rise in the price of standard copper, which now stands near £111 a ton, which compares with £84, the lowest point recorded in the course of the past month. The recovery which has thus taken place has certainly been quite out of proportion to the amount of business transacted. Dealings, in fact, might be described as utterly insignificant, though this is not really surprising, owing to the prohibition of speculative trading. It seems absurd that such fantastic movements, running into as much as £25 a ton, should be possible in the space of a few weeks with but few transactions passing; but the fact remains that there are only a few sellers, and the limited supply of warrants is lodged in strong hands. It is rather difficult to explain the change of sentiment which has become manifest. Of course, so far as warrant copper is concerned the fall was much overdone, and a natural reaction was bound to ensue, and the latter having synchronised with inquiries by parties who were short against outstanding contracts, and some demand from sulphate makers for rough copper, the upward movement was the more pronounced in face of the unwilling attitude of sellers. There is some reason for believing, however, that American manipulation has been at work in one direction and another, as may be surmised from the rather sudden disappearance of cheap American offers of refined copper which has thus resulted in the current quotations being brought to within measurable distance of the terms maintained steadfastly by the chief producing groups. Alongside of the swift rise in warrant metal there has, however, not been much change in the state of the market for fine copper, beyond the fact that second-hand metal is less plentiful on this side, and more firmly held in anticipation of some revival in the demand from consumers. Developments are thus being awaited with no little curiosity, especially in view of the highly inflated level of values ruling. American authorities in any case seem more hopeful that the strong control exercised by the copper magnates must eventually influence consumers and stimulate new buying, but this remains to be seen, although it is argued that producers have already placed the great bulk of their output over the current half-year, and that, therefore, they have no big lines of metal to sell for several months to come. Admittedly there are possibilities in the way of a revival of buying by consumers who neglected somewhat to cover themselves ahead, but it is rather doubtful whether the orders to emanate from these quarters will be of sufficient importance to enable first hands to secure anything like a big business until fresh requirements for munitions are being released, a prospect which it is as yet rather premature to discuss, since it is understood that needs in that respect were already covered far ahead or right up to the end of this year. American consumption is undoubtedly heavy, manufacturers being reported to be well supplied with orders to keep them going for another five months or so. On the other hand, American production is excessive, a fact to be remembered, although it is to be inferred that American interests can now afford to accumulate supplies and are well able to persist in their arbitrary control.

The Metric System.

Judging from recent items of news, the demand for the adoption of the metric system and decimal coinage is gaining strength, though the Government maintains an attitude of uninterested aloofness from the subject. Asked by Mr. M. Barlow, in the House of Commons, whether, in view of the advantage to the internal and external trade of the country, he would consider the appointment of a committee to inquire into the matter, Mr. Harcourt said that the compulsory use of metric weights and measures was not contemplated by the Board of Trade, and he doubted the desirability of appointing a committee. The adoption of decimal coinage was a matter for the Treasury. However, the indifference of the Government is a small matter; everyone knows that it never moves unless it is pushed hard enough, and it is the nation's business to exert the necessary pressure. The London and Provincial Chambers of Commerce, the London Corporation, the Institution of Electrical Engineers, the National Federation of Building Trades Employers, and other important bodies have joined in the movement, and editorials in the daily Press have supported it. We welcome a leading article in our contemporary the *Builder*, which vigorously advocates the cause of reform. In the United States the scientific departments of the Government have taken the lead, but it is interesting to note that the National Wholesale Grocers' Association is also working hard for the metric system, thus showing that practical commercial men over there, whose business transactions would be intimately affected by the change, and who, if anyone, might be expected to raise difficulties, are convinced that the advantages of the metric system far outweigh the drawbacks attending its compulsory adoption.

THE ELECTRICAL EQUIPMENT OF A MODERN FOREIGN SUBMARINE BOAT.

By NORMAN H. WOOD.

When running on the surface this vessel has a displacement of about 180 tons, and is propelled by a 6-cylinder double-acting reversible Diesel oil-engine of 350 H.P. and 450 R.P.M. The maximum surface speed is about 12.5 knots, and the cruising speed 10 knots, with a radius of action of 950 miles. In the submerged condition the submarine is driven by means of a storage battery in connection with an electric motor of 330 H.P. at 115 volts and 460 R.P.M. which imparts an under-water speed of about 9 knots for 1½ hours or 8 knots for 3 hours. Diving and emerging are effected by filling or emptying the ballast tanks, distributed fore and aft and at the sides of the battery tank. Two tanks for trimming are fitted, connected with each other and the sea; an auxiliary buoyancy tank is also provided to compensate for alterations in weight during the voyage. A complete pumping equipment comprising two main bilge pumps of 26 H.P. each and one auxiliary bilge pump of 8 H.P., together with one hand pump, is fitted, all of which will work at a depth of 60 metres.

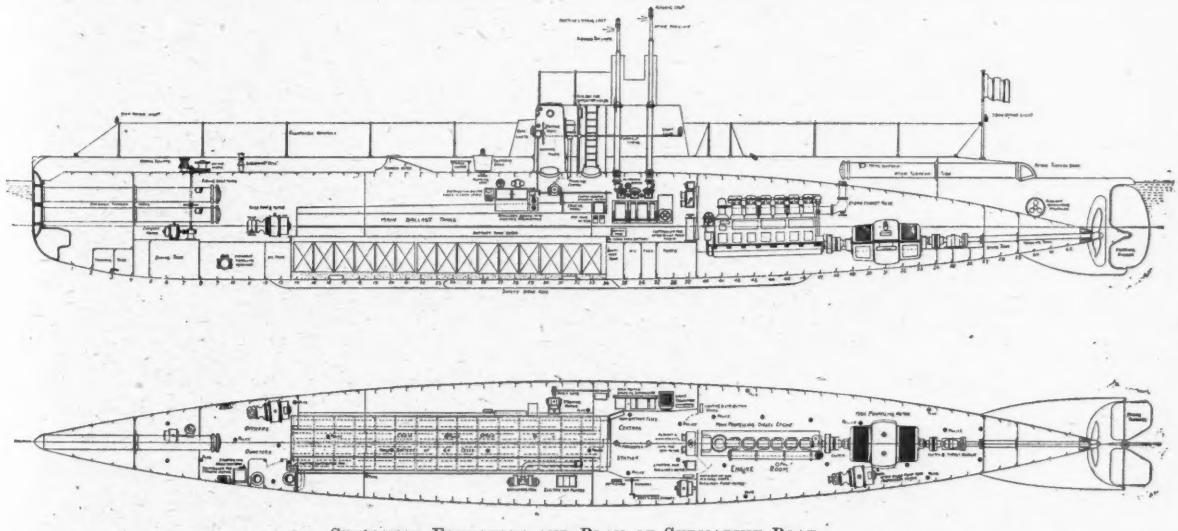
The storage battery, situated amidships in a special steel tank, consists of 60 cells connected in series and arranged in four longitudinal rows of 15 cells each, as with this arrangement the magnetic effect on the projector compass is practically nil. The plates of the individual cells are of lead, but as they are called upon to withstand repeated heavy discharges, the positives are of the large-surface type, whilst the negatives are pasted. Grooved wood separators are inserted between the plates, and a space of 60 mm. is allowed between the lower edges of the plates and the container bottoms to collect any mud that may accumulate. The containers are of special vulcanite composition, with watertight covers, on each of which is mounted a large inspection plug carrying a small non-return valve and flexible rubber connection. Running just above each longitudinal row of cells is a vulcanite pipe, the forward end of which is closed, whilst the after end joins up to a common pipe connected, through a non-return battery valve, to two electrically-driven exhaust fans. The flexible tube fitted to the cover of each cell joins up to the overhead pipe, so that if either fan is running the explosive gases are sucked away from each individual cell and thrown overboard, whilst air from the tank is admitted into the cell through the small inlet valve. Each individual cell, as well as the battery tank itself, is thereby perfectly ventilated, and the possibility of an internal explosion is entirely removed. The officers' quarters lavatory is connected to the forward end of the battery tank through a special lead-coated vent pipe with screw-down flap cover, which is opened when the fans are running. The floor and sides of the tank up to a height of 110 mm. are covered with 2-mm. sheet lead, soldered at the corners to form an acid-tight tray, and over this and completely up the sides is placed a covering of 2-mm. 20-megohm rubber sheeting vulcanised directly on to the metal. The rubber covering is applied to all other fixed metal parts in the tank, and those parts which, owing to battery repairs, removals, &c., cannot be permanently fixed, are treated with three coats of anti-sulphuric enamel. The battery tank cover is of 5-ply wood impregnated with acid-proof enamel, and over the whole is stretched a 3-mm. thick seamless rubber sheet, secured to the upper sides of the tank, with small teak channels and screw-down clips, whereby the whole tank is rendered gas and watertight. The capacity of the battery is as follows:—

3,160 ampere-hours or 350.76 KW.-hours at the 1 hour discharge rate.

4,610 ampere-hours or 525.54 KW.-hours at the 3-hour discharge rate.

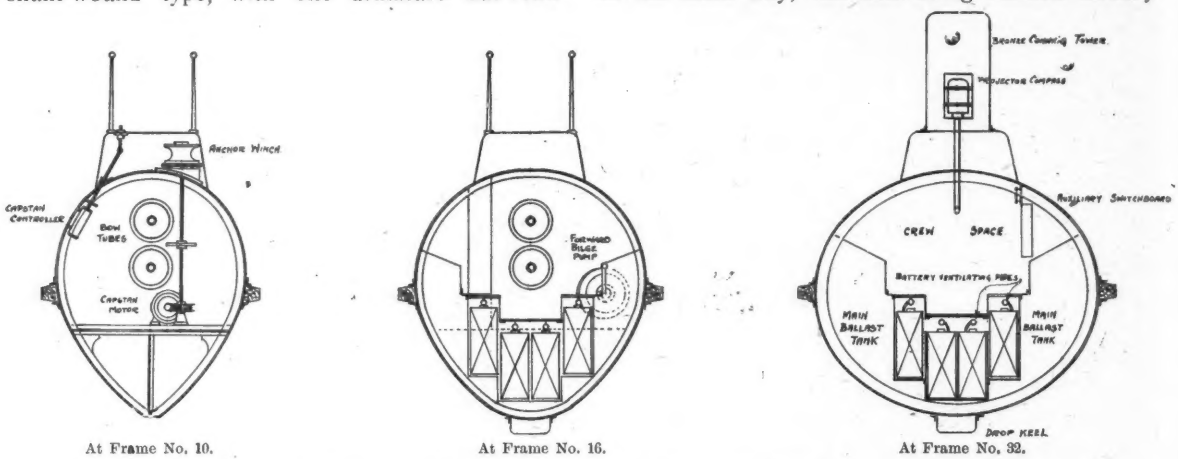
5,980 ampere-hours or 699.66 KW.-hours at the 10-hour discharge rate.

The battery can be discharged at the 1-hour rate without excessive heating taking place; further, the vessel can assume an angle of 25 deg. in any direction without the acid running out of the cells. The total weight of battery and connections is 37,000 kg. The battery ventilating valve placed between the fan trunk and the tank top is of the automatic non-return-flap type with a small cock and run-off pipe to drain away any liquid that may accumulate there. The connections between the individual cells are of H.C. copper electrically coated with lead, the same type being used for the conductors between the battery and main motor fuses. The latter leads are covered with 2-mm. para rubber vulcanised directly on the metal, and protected with a sheathing of 1-mm. sheet bronze soldered at the seams. Where these leads pass through the 7 in. channel at the after end of the tank, gunmetal glands with rubber packing are fitted to prevent ingress of sea water. The cells are arranged in two groups of 30 in series, with the middle wire permanently connected at their junction point, and earthed through an ammeter in conjunction with a small overload cutout. To check



Sectional Elevation and Plan of Submarine Boat.

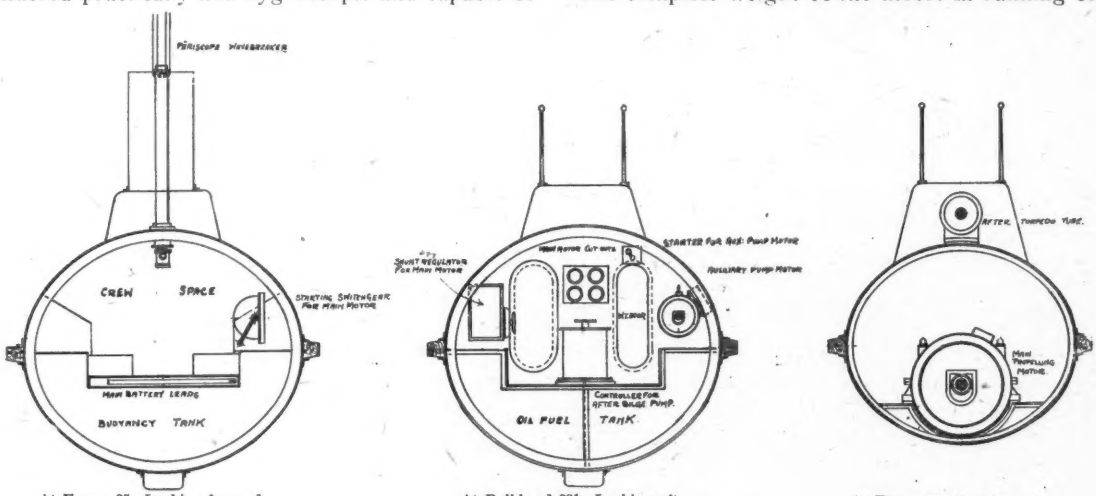
the efficiency of the battery, two ammeters reading to 3,000 and two ampere-hour-meters registering to 9,999 are placed in circuit with the main leads, the latter meters being of the double-dial type fitted with ratchet and pawl gear, which automatically enables them to register charge and discharge currents. Each of them is also fitted with a small winding gear to enable the dials to be quickly reset to zero if desired. The ammeters are of the long-scale illuminated-dial type, and have each a double-pole change-over switch, operated by hand, to enable them to register charge and discharge currents. An illuminated-dial voltmeter and switch are also provided. The main propelling motor is of the 8-pole shunt-wound type, with one armature but two



At Frame No. 10. At Frame No. 16. At Frame No. 32.

Transverse Sections of Submarine, Looking Forward.

separate windings and two brush-rocker sets placed one at each side of the common field, with interpole and compensating windings fitted to prevent sparking and surging when starting up. The full output capacity is 330 B.H.P. at 460 R.P.M., at 115 volts, for 1½ hours, with a temperature rise of 50 deg. C. allowed. Cooling is effected by natural draught, and as seamless mica only is used for armature insulation, the whole is rendered practically non-hygroscopic and capable of



At Frame 35—Looking forward. At Bulkhead 39½—Looking aft. At Frame 49—Looking aft.

Transverse Sections Abaft.

withstanding any temperature up to 90 deg. C. The cast steel yoke has its bearings secured to the lower half with light steel sheets screwed on to the bearing arms, to prevent splash water from the bilges reaching the commutators. The solid shaft is ground up from 3 per cent. nickel steel, with a minimum diameter of 120 mm. in the bearings, as it is required to transmit the full power of the oil engine when the boat is running on the surface. A thrust collar is fitted in each bearing to take up the weight of the armature in the event of the boat assuming a list to fore or aft.

The motor is connected to the engine and tail shafting through claw-couplings, either of which can be thrown in or out quickly. When running on the surface, both couplings are connected up and the motor, driven as a dynamo, is used to charge the battery, but when diving or running submerged the engine is uncoupled, and the submarine is propelled by the motor. There are, however, isolated instances when it is desirable to charge the battery when the boat is at anchor or in dock, in which case the motor is coupled to the engine but uncoupled from the tail shaft, and driven as a dynamo in the usual way, the field being excited directly from the battery. When driven thus, the machine is capable of giving 750 amps. at 165 volts, or 1,500 amps. at 140 volts continuously, which ensures the battery being fully charged in about four to five hours. This motor can be run in either direction, or driven as a dynamo without any brush regulation; further, sparking is not set up at any load, even with a variation in pressure from 160 to 105 volts due to the battery voltage sinking on discharge. The complete weight of the motor in running order is 6,880 kg. The machine is started, stopped, and regulated by the manipulation of four quick-break change-over knife switches and a shunt regulator; no starting rheostat is installed (see article on "German Submarine Motors," Elec. Rev., May 28th, 1915).

To start, the shore charging switch is first of all placed in the "down" position, and current is at once sent through the shunt windings; it is thus quite impossible to start the motor upon an open

field. The armature windings are now placed in series across the half battery pressure, and an instantaneous current of about 3,000 amps. passing through them causes the armature to revolve and reach a final speed of 85 R.P.M. By means of the shunt regulator the speed is increased to the utmost, the shunt resistance is quickly cut out and, at the same time, the armature windings are placed in series across the full battery pressure, with a speed of 165 R.P.M. Again the shunt resistance is all switched in slowly, then cut out, and the armature windings are placed in parallel across the full battery with a resultant speed of 330 R.P.M. The speed can now be adjusted at will up to 460 R.P.M. With this arrangement a continuous regulation from 85 to 460 R.P.M. is possible without interfering in any way with the lighting and auxiliary circuits, a most important point. To protect the motor against wrong switching whilst starting up, constant overloads, &c., double-pole fuses and automatic overload releases fitted with overload and time-limit relays are provided. The 3,000-amp. fuses are of pure silver wire enclosed in a very light watertight steel case carrying on the underside two small bronze safety valves, controlled by springs, &c., to release any gas pressure that may be set up in the event of the fuses blowing.

(To be continued.)

LABOUR AND INDUSTRY.

(*Concluded from page* 80.)

We have already quoted the views of the Lord Mayor of Birmingham respecting the need for higher efficiency on the part of the worker in exchange for the higher standard of wages of the future, and we may now refer to the opinions very frankly expressed by Sir Richard Cooper, M.P., at a meeting of Trade Union delegates at Walsall, held last month under the auspices of the local Trades and Labour Council. Sir Richard was of opinion that past misunderstandings between Capital and Labour should be removed, that there should be a closer relationship between the two parties, and that a new system should be introduced which would be mutually advantageous to employers and workpeople. In view of a Birmingham conference which was to be held, he asked organised Labour to consider whether, if they found a certain number of employers were willing to give them much of what they had been fighting for—recognition and a better wage system—they were prepared to respond by bringing any class of labour which was at present inefficient up to higher standard. It had to be clearly recognised that if a much higher rate of wages was to be paid, labour must be brought up to a corresponding degree of efficiency. Sir Richard, who was addressing his constituents, expressed himself as being tired of politics and convinced that nothing could be done at Westminster; he added that he had taken up this Labour problem because of his anxiety that progress should be made. Many will join with him in hoping that we shall not "go on tinkering with it for an indefinite period." It was stated that women who had gone into munition factories absolutely unskilled could in a few weeks turn out double the finished product of some skilled trade unionists; but while it was not suggested that that applied to trade unionists as a whole, it was a fact that a large proportion of Labour in this country was not as efficient as it might be. Sir Richard said that he had works in America—where, he admitted, there was more speeding-up of labour, but where for the same hours of work double the rate of wages was paid—from which skilled engineers could turn out machines and land them in this country as cheaply as a Birmingham or Sheffield manufacturer could make them. This fact, he thought, showed that with a proper system of organisation in this country, wages could be doubled.

According to the local reports of the Walsall meeting, there was a rejoinder by the secretary of the Trades Council, which, as printed, is both a confession of, and a justification for, inefficiency. It was said that the reason why no trade unionist would work to his fullest capacity was that he knew that if he did so, his employer would at once cut down the rates of pay.

But this was no answer to Sir Richard, who presumably considered such a grievance as being open to remedy as part of any new bargain. How far we can expect Labour to adhere lastingly to any new agreement respecting increasing the workers' efficiency in exchange for new standards of payment, is one of the very important parts of the whole controversy. By no means has all the slacking that has occurred been due to inadequate wages; there has been some of it in war-time directly owing to wages being much higher than the normal. Fatigue through over-strain, excessive overtime, perhaps the need of a holiday (the old saw is perfectly true that "all work and no play makes Jack a dull boy"), and undesirable surroundings in the factory, may account for much, and call for serious and sympathetic consideration, but while reasonable thought should be given to such points, particularly in war-time, we must not imagine that industrial life and occupation after the war can be transformed into an enchanting holiday. Betterment of conditions is at best a slow process and recognising that we have got to *work* for our living as well as play, we shall do well to get pleasure out of it by putting our best into it, remembering that a measure of hardship makes better characters of us all. Life may be more strenuous after the war than it was before, but if it can be conducted with greater harmony it will be more bearable, perhaps bringing to the worker a greater spirit of content. If the worker increases his output, and thus increases the efficiency of production, the employer should be able to pay higher wages. It will be agreed that the labourer is worthy of his hire, and the good worker should not be penalised for performing good work, either by his employer or by his fellow-workers. In the past we believe that the enterprising worker has been penalised by Union men if he has set a pace that they have not desired to maintain. There have been officials who have taken away legitimate inducements to speeding-up in the way complained of, but inasmuch as both sides have erred, this is just one of those points for consideration at such a conference as Sir Richard mentioned. Reliable assurances of higher efficiency should render grievances of the kind bad policy for the foreman and for his employer. Harmonious co-operation is, perhaps, an ideal, but that is what we must aim at if we are going to get the best out of both Capital and Labour. *Incomplete* organisation of either Capital or Labour will leave the way open for difficulties. Complete organisation may make a basis for general agreement for the whole of our industries reasonably probable.

If we are to judge from the speech delivered by Mr. Harry Gosling before the National Transport Workers' Federation, the huge profits that have been made by shipowners have whetted the appetite for higher wages to be paid for earning those profits, but from the shipowners' side we find the Government "Excess Profits" measures attacked because of their economic unsoundness. The shipowners want to put the money to building new ships—incidentally swelling their capital account—which will be so badly needed at the end of the war. Shipbuilding operations are proceeding in neutral countries at high speed and on an enormous scale. This "production" will be needed to make up for the great war losses of the past two years, but British shipowners are not blind to the possibility of a certain injury being done to their supremacy by this neutral activity. However, on the point of those "Excess Profits," the Government must have all the money it can get to finance the war; the Navy is protecting our shipping; and the shipping is feeding us all. But it must be remembered that after the war the bigger the shipping facilities there are at disposal for imports and exports, the more speedily will industry be able to return to its normal activity. The transport workers ought to be enabled to see that. We note from Mr. Gosling's speech that his Federation intends, as far as lies in its power, to see that any changes in our fiscal system shall be *preceded* by an adequate established minimum wage, a limitation in the hours of labour, State provision of work for the unemployed,

and an assured standard of life for one and all! That this ambitious and idealistic programme was received with "cheers" goes without saying—such things generally are applauded by audiences of a certain kind under excitement; but the "cheers" are doomed to die away into silence when, calmly and dispassionately, Labour and Capital sit round a table and try to find how, with the menace of foreign competition still existing, or even without it, for the matter of that, such things are to be brought into being in the days that, we trust, are near at hand. The Federation passed a resolution affirming that Trade Unions should so adjust working hours as to secure employment for demobilised men after the war and make a surplusage of labour impossible. Yet the door is to be left open for German manufactures to be dumped here, reducing the available work, until everybody has an adequate minimum wage; and though a surplusage of labour is to be made impossible, the State is to provide work for the unemployed! There is just a little contradiction somewhere in these programmes, all of which, and much else besides, shows that Labour orators and organisations—well, want more Bovril! One important Labour organisation recognises that the worker cannot secure his ends unless the State safeguards the interests of his employer. Mr. Gosling's Federation reverses the order, and says give us better wages, &c., and we will give State protection to Industry. The cart before the horse, assuredly!

We referred a week or two ago to the fact that, in spite of all that has been done in the interests of Labour in Australia, no era of Industrial Peace has yet dawned there. This opinion receives full confirmation in a speech delivered by Mr. Herbert Brookes to the Victorian Chamber of Manufactures, reported in the *Australian Statesman and Mining Standard* for May 18th. The speaker deplored the marked increase of "industrial strife fermented by self-seeking agitators" and supported by the militant section of Trade Unionism. The Chamber re-affirmed its determination to thwart, by means of continuous organisation and co-operation, the efforts of those who were working to the destruction of all domestic peace and progress. Members of the Chamber were prepared to make sacrifices in the interests of Industrial Peace, and Australia ought to emulate the example of France, where, though it was the home of Syndicalism, the Unions welcomed the introduction of women into their factories and skilled workers willingly undertook their training. The courage of the French people, Mr. Brookes described as a splendid rebuke to all shirkers, and he said that one could not be other than humiliated by the position in Australia, where, "even in this supreme hour of trial," domestic strife was predominant. The speaker went on to show that it was only by increasing production that wages could be kept high. If the present spirit of strife was to be continued when we were at peace again, how could we hope to compete with other nations? If the seriousness of the Australian position is in proportion to the strength of Mr. Brookes's strictures, the services of Mr. W. M. Hughes, the Prime Minister, will be sorely needed now he has reached Home from Home again, if he is going to secure the co-operation of his own people in the work of Imperial consolidation and progressive development which has been the theme of his speeches here. But these are largely domestic questions for Australia; we are lost in admiration at the magnificent service that the Commonwealth has rendered to the cause of the Allies in Gallipoli and elsewhere; what we are being frequently reminded of by such speeches as Mr. Brookes's is that Australia has not yet found a solution for the problems of Labour. Mr. Brookes advocates the presentation of a united front by the employers in order to "crush this militant official Union caste." We quote his following words:—

> It was a profound cause of shame that, while the Empire was locked in a deadly struggle, official Industrial Unionism should be seizing every opportunity, like the Sinn Feiners, to take advantage of others' necessity and press for aggrandisement, which was not justified in the circumstances. In the opinion of many members of the Chamber, professional Unionism was becoming a caste, which was quite as offensive as the military caste in Germany, which had led to the present war. If he were asked calmly which of the two castes he would prefer to live under, his answer would be that he would infinitely prefer the military tyranny of Germany to the tyranny of Industrial Unionism. The one led to competency and efficiency, and the other to incompetency and inefficiency, as well as to individual and national decay. He trusted the Empire would see the death of both when peace was established.

From the utterances of Alderman Chamberlain, Sir R. Cooper, M.P., and others, we find a more conciliatory spirit present at home in viewing the developing situation, and while hard things are undoubtedly amply justified by numerous occurrences, they will not make easy the pathway to Peace. Yet the truth must be told, and there will have to be plain-speaking and hard-hitting if Labour is to understand the errors of its ways and to be brought to act up to its responsibilities, so that after-the-war industry may be made attractive to all parties concerned in it.

During the past week several important events have occurred in connection with the subject of Labour after the war. One of these has been the publication of the summary of memorandum by the Demobilisation Committee of the Social Welfare Association of London, in which it is declared that reinstatement to be successful "must be carried out by Capital and Labour, acting in partnership under the authority of the Government." The Committee also sets out a scheme for a Central Committee, with local Committees, to carry out the work. The other event was the receiving of the deputation of the Industrial Triple Alliance by Mr. Asquith yesterday. In this connection, Mr. W. A. Appleton, Secretary of the General Federation of Trade Unions, is credited with having urged Trade Unions and employers to set aside all petty jealousies and to co-operate in an effort to find a solution for dealing with the reinstatement problem. He holds that a joint conference would be of inestimable value, and goes so far as to recommend Lord Derby as one who would readily facilitate the task. We have no doubt that Lord Derby, having, under great difficulties, done such magnificent work for the nation in securing recruits for the Voluntary Forces, will feel that no task would be more worthy of his good offices than that of facilitating the return of those men to industrial activity when their fighting work is done. Whether he will feel that the time is suitable for him to so concentrate his attention is open to question, in view of his speech of a few days ago, in which he saw no signs of a speedy termination of the war. That there will have to be joint effort, conference, co-operation and co-ordination of all forces concerned, in settling the vast problem along harmonious lines, is perfectly obvious. What is so essential is that each side should be able to sympathetically appreciate the point of view of the other, and that there should be a willingness to give as well as take. Only thus can we steer safely amid innumerable rocks, pass safely over turbulent waters, and avoid serious friction in negotiating a situation of unexampled difficulty, fraught with consequences quite without parallel for either good or ill.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Mexican Eagle Bitumen.

We have received a sample of the bitumen produced by the Mexican Eagle Oil Co. at their refineries at Minatitlan, Tampico, &c., under the most modern conditions and by the latest refining plant; we understand that the bitumen is always of the same high quality, and it is guaranteed 99·5 per cent. pure, which is as high a degree of purity as it is possible to obtain in a material of this sort. This bitumen is used extensively by cable manufacturers for all electrical purposes, including pothead insulators for cable ends, and for filling joint-boxes and ordinary cable troughing. It has been tested for dielectric strength; breakdown was found to take place at over 40,000 volts, with spheres of 2·2 cm. diameter, separated by 1 mm., fully immersed in the bitumen and allowed to cool for 24 hours after fusion. Particulars may be obtained from the Anglo-Mexican Petroleum Products Co., Ltd. (Bitumen Department), Finsbury Court, London, E.C.

The Bowden-Thompson System of Protection for Electric Cables.

The former practice of relying solely on overload devices is not now considered sufficient protection for cables, and it is essential to adopt some means for automatically disconnecting a faulty length of cable from the rest of the system before the fault has seriously developed. Moreover, the disconnecting should be performed as rapidly as possible, in order to minimise the damage to

the cable and avoid any possibility of injuring the plant and switchgear, or disturbing synchronous machinery.

The faulty cable should be isolated before the main conductors have short-circuited or broken down to earth, and, in order to achieve this, it has been necessary to design a special form of cable, as shown in fig. 1, with metallic shields interposed between the cores, and also between the cores and the lead sheathing, in order to intercept any leakage currents.

The principle on which the system works is shown by the diagram of connections (fig. 2), which shows a protected cable switched from one end only.

A is the metallic shield between the cores, B the shield between the cores and the lead sheathing, C the main conductors. If any leakage occurs from any of the main cores to shield A or B, it is directed through relay D to earth, and the relay operates the main switch by trip coil E. If the cable is externally damaged, shield B is earthed before the main cores are reached, and as this shield is maintained above earth potential by battery F, current will flow through the relay and open the main switch. If preferred, a small transformer may be used instead of the battery.

The following diagrams show the system as applied to cables switched at both ends, ring mains, &c.

Amongst the chief advantages claimed for the system are the following :—It isolates the faulty cable before the main conductors

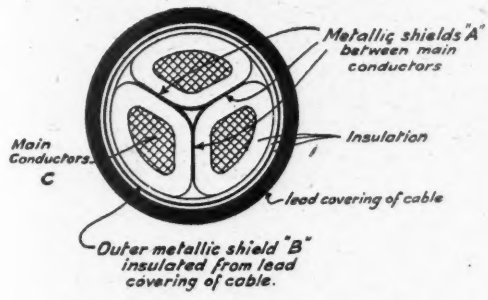

Metallic shields "A" between main conductors
Insulation
Main Conductors C
lead covering of cable
Outer metallic shield "B" insulated from lead covering of cable.

Fig. 1.—Section of Cable Protected on the Bowden-Thompson Patent System.

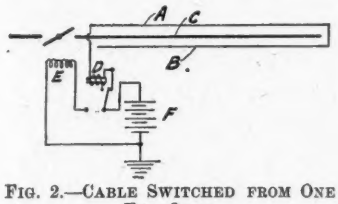


Fig. 2.—Cable Switched from One End Only.

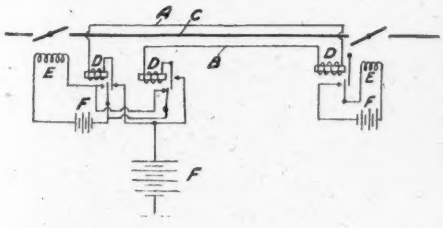


Fig. 3.—Cable Switched at Both Ends.

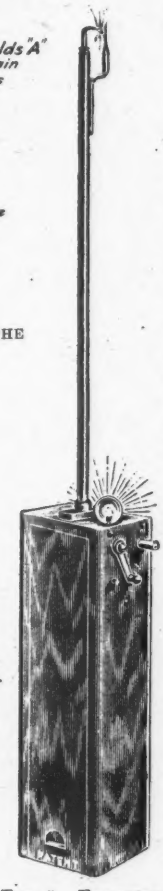


Fig. 5.—Electric Gas Lighter.

short-circuit or break down to earth, thus preventing damage to cable, plant and switchgear.

It provides protection between phases as well as against earths.

Its operation is not dependent on any supposition as to the path

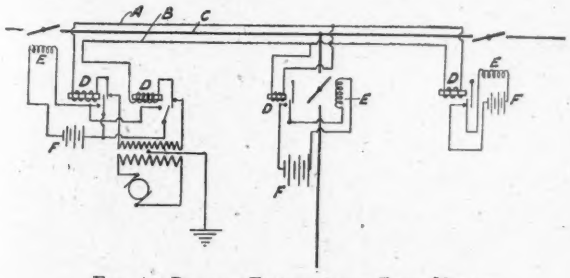


Fig. 4.—Branch Feeder from Ring Main.

of the heaviest current in case of a fault, nor does it assume that parallel feeders of the same cross-section share the load equally.

It is independent of any fluctuations in supply pressure or load.

As faulty sections are simultaneously isolated at both ends, the system is suitable for protecting parallel feeders, branch feeders, ring mains, or any combination of feeders.

If the cable is externally damaged when the supply is off, the relays will operate and prevent the cable being made alive until the fault has been cleared.

It will not operate on sound cable when being switched in, if the switch contacts are not all closed at the same instant. This is experienced with some balanced systems, which either have to be cut out when switching is being done, or a time limit is inserted.

There is no tendency to switch out sound feeders in parallel with a faulty one.

Special switchgear is not required, and the switchgear will not have to deal with excessive overloads when faults occur.

The system is being introduced by the Macintosh Cable Co., Ltd., of 176, Rice Lane, Walton, Liverpool.

Electric Gas Lighter.

Messrs. Ward & Goldstone, of Sampson Works, Salford, are introducing the "Gnita" electric gas lighter and hand lamp as a novelty for the forthcoming season.

We illustrate this device in fig. 5; it consists of a Volex dry battery and ignition coil arranged so as to give a series of sparks at the end of the lighter. A small electric lamp is also provided, which can be switched on when entering a dark room, and thus help to avoid breakages of gas mantles.

We may add that the standard lighter is 20 in. long overall.

An Electric Bullet Probe.

The determination of the exact position of a foreign body, such as a bullet or piece of shell in a wound, has always been a matter of considerable difficulty. Even an X-ray photograph is frequently vague, and sometimes actually misleading, and therefore any instrument which will indicate more definitely the position of these bodies, and so supplement the information given by the X-rays, cannot fail to be exceedingly valuable.

An electric bullet probe, designed for this purpose, has recently been introduced by the Cambridge Scientific Instrument Co., Ltd., of Cambridge, England. The complete instrument consists of a fine metal probe and a contact wire of the same metal, both of which are connected by flexible leads to a galvanometer. The contact wire is placed in the edge of the wound in good contact with the tissues, and the probe is employed in the usual way. Since the probe and contact are both of the same metal, there is no difference of potential between them when they are inserted in the wound, and, consequently, no deflection of the galvanometer. As soon, however, as the probe touches some other piece of metal in the wound a voltaic cell is formed, of which the metal constitutes one pole and the contact in the edge of the wound the other, the

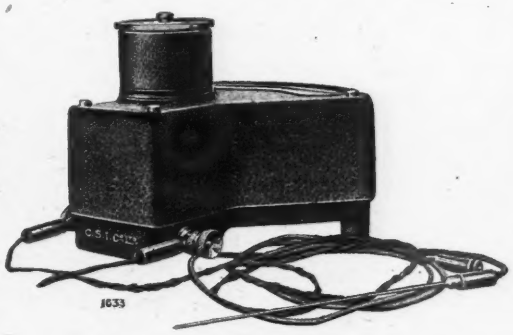


Fig. 6.—Electric Bullet Probe.

blood being the electrolyte. Consequently, a current flows through the galvanometer and deflects the pointer. The instrument is, therefore, simple and self-contained, no battery or other accessories being required.

The galvanometer used is of the type shown in fig. 6. It is a moving-coil instrument fitted with a pointer, which swings across a scale, thus enabling the deflections to be observed directly.

Although very sensitive, this galvanometer is of robust construction. It is portable, and when in use can stand on the table conveniently near the patient. The extent of the galvanometer deflections depends on the size and nature of the metallic body touched by the probe. The great sensitiveness of the instrument is shown by the fact that the presence of a small piece of metal measuring only a millimetre or so in any direction causes a deflection of 10° or 20° (about 3 cm. on the galvanometer scale), while for larger pieces, the size of a bullet, the pointer is thrown completely off the scale. As long as the probe is not in contact with any metallic body, the pointer remains steady. It is evident that by means of this instrument the presence of even a small piece of metal is distinctly indicated by a comparatively large deflection of the pointer, while the absence of any deflection is a clear proof that no metal has been touched by the probe.

The probes are made in various thicknesses for different uses, and can be very fine when necessary. The probe and contacts and the portions of the leads which may come near the patient can readily be sterilised.

D

"Kwik" Electric Conduit Fittings.

The accompanying illustrations show a new and quick (or "kwik") type of fitting for jointing conduit, applicable to plain couplings, elbows, tees and other items. The special feature of the device is the means provided for opening the socket to receive the pipe; the screw S is made with a collar *s*, and is slipped into position through the open slot in the lug L, the latter being slightly sprung open to receive it when assembling the fitting. Once in place, the screw cannot fall out and be lost; a few turns backwards with the screwdriver force open the grip by means of the collar, enabling the pipe P to be readily slipped into the socket A,

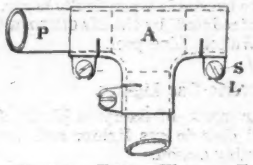


Fig. 7.—Three-Way "Kwik" Socket.

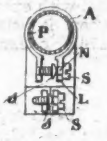
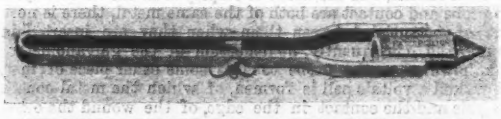


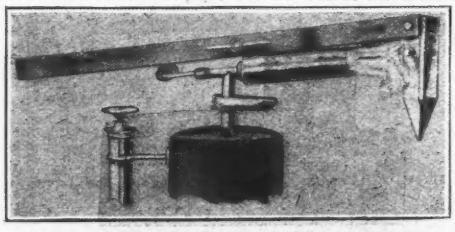
Fig. 8.—End of Socket Opened to Receive Pipe.

after which the screw is turned forward to grip the conduit in the usual way. The effect of this arrangement is to save time in erection, a matter of present and increasing importance; the inventor and patentee, Mr. H. F. Joel, of 72, Finsbury Pavement, E.C., claims that experience shows that the economy of time in fitting the pipes together is 50 per cent., and the cost of labour in wiring is reduced by about one-third. The invention has also been adapted to the opening and closing of the covers of switch and street surface inspection boxes, valve covers, &c.

A Combination Soldering Bit.

A soldering bit which has many advantages over the ordinary type of soldering iron is shown in the accompanying illustrations. The bit is made of pure copper of octagonal shape, 4 in. in length and 1 in. in width. The copper bit is mounted in a handle about





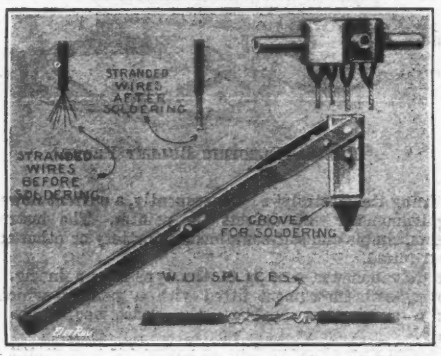


Fig. 9.—Combination Soldering Iron in Ordinary Adjustment. Heating on Blow Torch, and in Use as Soldering Pot.

15 in. in length, and by means of a wing nut and bolt can be adjusted to any desired angle or kept in a rigid position like the common soldering iron. The bit may be folded or reversed in the handle, thus shortening the overall length and preventing the point from damaging the tool bag in which it may be carried.

The construction of the handle is such as to enable it to be placed upon the burner of a blow torch and heated, thus avoiding the use of a blow torch direct on the wire. This method is shown in one of the illustrations. There is a groove on the nose of the copper bit for facilitating the soldering of wire.

In cases where a soldering pot is not available or its use is not advisable, this combination tool may be used. The base of the copper body is drilled out to a depth of 2 in. and an approximate diameter of ¾ in. A miniature soldering pot is thus formed in the copper body, in which solder may be readily melted.

This combination soldering tool is made by the Chambers, Bering, Quinlan Co., Decatur, Ill.—*Telephony.*

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Performance of Steam Turbine Sets.

Referring to the record performance of the Glasgow turbine, published in your issue of July 14th, I shall be glad if you can also insert the enclosed results, obtained from a Fraser & Chalmers set installed here in 1911.

I think too much prominence cannot be given to records of this kind obtained from all British-built machinery, particularly in view of the disastrous breakdowns of German-built plant reported from Shanghai and elsewhere.

This particular plant was installed here in June, 1911, and is of the well-known Fraser & Chalmers-Rateau multi-cellular type, coupled to a Siemens alternator with a direct-coupled exciter.

The set was designed for 1,000 KW. capacity, running at 3,000 R.P.M. The alternator generates three-phase alternating current at 50 periods, at a pressure of 3,000 volts, and the set has an overload capacity of 25 per cent. for two hours, and 50 per cent. for half-an-hour.

During the year ending March, 1916, this set generated 6,084,000 units at about 80 per cent. power factor, which equals 94·6 per cent. of the total output. The machine has done a considerable amount of overload up to peaks of 1,550 KW.

The daily load factor has reached 104 per cent.

The machine has been overloaded for 13¾ hours out of the 24, and has had to take the peak load with 24 in. and 25 in. of vacuum, due to shortage of condensing water.

It is two years since the turbo was opened out, and with the exception of slight adjustments to the governor, no repairs of any kind have been required.

Such results may not establish a record, but I think, coupled with the performance of the Glasgow plant, they argue well for the British manufacturer.

J. C. Williams,
Engineer and Manager.

Erith Electricity Supply and Tramways Dept.,
July 25th, 1916.

[This is certainly an admirable record of good service. We shall be glad to receive particulars of similar performances.—Eds. Elec. Rev.]

Mechanical Aids for Wounded Men.

May I ask you, through the medium of your valuable journal, to appeal to all electrical manufacturers and contractors who have any form of workshop, whether large or small, to help me in the following excellent cause:—

A very large number of metal leg and arm rests are required for those of our wounded heroes returned from the front with fractured limbs. I have taken it upon myself, on behalf of a branch of the Red Cross Society, to offer to supply a certain number of the necessary parts required in making up the above frames. This form of apparatus relieves the wounded of much suffering, and helps to hasten the mending of the fractures.

Anybody with an ordinary lathe can bend and drill certain simple parts of the apparatus, made up of ordinary pieces of flat iron strip and galvanised rod, and if contractors would kindly help to supply even a small number of these parts per week, I should then be in a position to keep this branch of the Red Cross equipped with sufficient material to enable the amateur workers who put the frames together to complete a considerable number per week.

At the present time thousands of these frames are required, and as the putting together is all done voluntarily, every small help is of valuable assistance. Therefore, again I appeal to all manufacturers and contractors to give me their support in this matter.

The raw material will be supplied by me, and patterns of the parts required can either be seen in my office, or would be sent on application.

Thanking you for granting me the space for this letter.

H. F. Simon,
Managing Director, Electrical Installations, Ltd.

27, Martin's Lane, E.C., *July 29th*, 1916.

Carbon Electrode Manufacturing in Sweden.—The carbon electrode manufacturing business of the Aktiebolag Brenas Bruk is being taken over by a new company in course of formation with a capital of £83,000.

HYDRO-ELECTRIC POWER PROPOSALS IN MYSORE.*

The total capacity of the generating station at Sivasamudram, Mysore, will be, after the installation is completed, 22,650 H.P., and after deducting 1,650 H.P. to be held in reserve to guarantee the continuity of supply, there will be available at the bus-bars 21,000 H.P. net for supply to the transmission lines. During about nine months of the year, there is sufficient water in the Cauvery river to generate at Sivasamudram 30,000 H.P. at no very great additional expense. The capacity of the generating station will be made up of 11 units of 1,150 H.P. each; 3 units of 2,000 H.P. each; and 1 unit of 4,000 H.P.

It is therefore possible to obtain 9,350 additional H.P. by changing the eleven 1,150 H.P. units to units similar to those of the third and fourth installations. The station would then consist of 14 2,000-H.P. units and one 4,000-H.P. unit, or a total of 32,000 H.P. at the buses, leaving available for the distribution lines 30,000 H.P. net. This substitution could be made remarkably easily; each of the three large penstocks of the first installation would be used for a 2,000-H.P. unit, and only eight new penstocks of 2,000 H.P. capacity bought. This increase of capacity could be obtained without any building modifications, and the forebay alone would have to be modified for three additional penstock intakes. With these small improvements, an additional 9,000 net H.P. may be obtained at a cost of approximately Rs. 15 lakhs.

Under the present allotment of water to be stored at Kannambadi Reservoir, during at least three months of the year the river supply is less than that required for 21,000 H.P., so this scheme will have to be abandoned. The number of consumers, both large and small, within reach of the power lines, is rapidly growing, and as the maximum supply of 21,000 H.P. from Sivasamudram is likely to be exceeded in the next few years, it becomes necessary to have recourse to a completely new installation elsewhere, to be operated in parallel with, or to entirely replace, Sivasamudram. For this the Cauvery river is ideal, as the Cauvery reservoir guarantees a certain definite discharge at any point below the dam.

Below Sivasamudram two projects offer themselves: (1) Shimsha and (2) Mekadatu. The power-station site of the former project is located on the Shimsha river just below the Shimsha falls, at its junction with the Hullabella river, about 7·4 miles from the Cauvery. The Mekadatu project is situated immediately on the Cauvery itself, about 25 miles along the river below Sivasamudram, and just within the Mysore State. The power-station site is within a few yards of the boundary line where the river enters Madras territory.

The first proposal embodies taking the water from the Sivasamudram head-gates through an open channel for approximately 9¼ miles to a forebay or intake, and thence in steel pipes 1¼ miles to a penstock header. This header would be under approximately zero pressure, with a stand-pipe or surge tank open above the high-water level at the intake, of sufficient capacity to discharge all the water in case of a sudden shut-down.

To provide a crossing at Handia Nulla, it is proposed to dam this nullah, thereby forming a very large reservoir for equalising the flow, and, most important of all, to provide a settling basin for removing silt and floating submerged vegetation.

From the penstock header, four penstocks will be taken to the generating station. It is proposed to install in this station four units of 10,000 B.H.P., net output with a provision for a future fifth unit, one unit being in reserve as spare. Each of these units will be direct-coupled to Francis turbines, and provided with its own exciter mounted on an extended shaft. Each exciter will be of sufficient capacity to provide excitation for two units. The penstocks will be provided with automatic closing devices at the penstock header and also electrically-operated from the turbine room. The turbine governors will be of the oil-pressure type with auxiliary oil systems and arranged for adjustments of load without shutting down the units. The switchgear and control apparatus will be of the remote-controlled automatic type, and the voltage regulators arranged to compensate for line losses.

The transformers will be of the oil-insulated, water-cooled type, as recently installed at Sivasamudram and Kolar Gold Fields, stepping the generator voltage up to 70,000—78,000 volts.

The power will be transmitted over new lines about 4 miles and fed into the present system.

The second project is to utilise the rapids at Mekadatu 25 miles below Sivasamudram and 3 miles below its junction with the Arkavati. At the head of these rapids, the Cauvery canyon broadens out to such an extent that it is possible to construct channels for conducting the waters of the Cauvery from the head to the foot of the rapids.

A dam is proposed to be constructed across the river and the water diverted into a suitable channel which terminates in a forebay just above the power station site at the foot of the rapids.

The dam is proposed to be of coursed rubble masonry approximately 1,500 ft. long and 12 ft. high.

The channel will be approximately 20,000 ft. long with a bed width of 22½ ft. and a depth of water of 10 ft., and will terminate in a forebay with four penstock intakes for four main units. No exciter penstocks are provided, as the exciters will be driven direct from the main units.

Three horizontal type generating units are proposed, each of 4,000 B.H.P. output, direct connected to suitable turbines. The generators will deliver three-phase, 25-cycle power at 2,200 volts and 80 per cent. power factor. The shaft will be extended for an exciter of sufficient capacity to supply excitation to two main units. Provision will be made for a future extension of a fourth unit.

The turbines will be of the Francis type, of 5,600-H.P. capacity, equipped with oil-pressure governors and pressure-limiting devices similar to those lately installed at Sivasamudram. The governors will be equipped with motors for load adjustment from the switchboard.

There will be four transformers (one spare) of the water-cooled and oil-insulated type, 1,750 KW. capacity, at 80 per cent. power factor, for stepping up the voltage from 2,200 to 70,000—78,000. There will be no separate transformer station, as at Sivasamudram, but all station apparatus will be located in one building, resulting in a considerable saving in capital cost, and obviating the necessity of a double operating staff.

The power will be transmitted over duplicate lines, 24 miles long, to Kankanhalli section house, and there fed into the present system. Both these lines will be on the same towers, spaced approximately 500 ft. apart. Suspension insulators will be used, and the lines protected from atmospheric disturbances by overhead grounded ground wires, and for the protection of stations aluminium cell lightning arresters will be provided at both ends.

* Abstract of paper read before the Mysore Engineers' Conference, and reprinted in the *Indian Textile Journal*.

LEGAL.

Brompton and Kensington Electricity Supply Co., Ltd.—Quinquennial Assessment.

At the County of London Quarter Sessions, held at Clerkenwell, Mr. A. J. Lawrie (the Deputy-Chairman) was engaged for nearly three days in hearing an appeal by the Brompton and Kensington Electric Supply Co. against an assessment of their works and cables of £22,800 gross and £12,000 rateable by the Royal Borough of Kensington.

Mr. Alexander Macmorran, K.C., and Mr. E. M. Konstam were counsel for the appellants, while Mr. Walter Ryde, K.C., and Mr. Cecil Whiteley appeared for the respondents.

On behalf of the appellants, evidence was given by Mr. Carpenter, of Messrs. Humphreys, Davies & Co., valuers; Mr. Spencer Hawes, of Messrs. May & Hawes; Mr. Ruthven Murray, Mr. K. S. Downe, general manager of the company, and Mr. J. T. Owens, the secretary.

On behalf of the Borough of Kensington, Mr. W. Harold Eve, rating surveyor, of Messrs. William Eve & Sons, Union Court, Old Broad Street, E.C., submitted a valuation on which he found a rateable value of £16,330.

Sir John Snell also gave evidence in support of the assessment, and, in the course of cross-examination by Mr. Macmorran, contended that he had done the right thing in basing his tables for renewals on a figure of £68,000, although the prime cost was £103,000. The witness also expressed the opinion that there would be a considerable drop in prices after the war.

Mr. Macmorran: I suggest not for two or three years.

Sir John Snell: I happen to be connected with a large number of important contracts, and I have it from most eminent manufacturers in this country that there will be a very considerable drop, especially in metals.

Mr. Macmorran: Do you anticipate much of a drop in wages?

Sir John Snell: I anticipate a drop. The war bonus will have gone.

In further cross-examination, Sir John admitted that in a certain calculation in which he had taken the 3½ per cent. table, it was customary until a few years ago to take the 2½ or 3 per cent. The price of money had increased in the meantime, and it was now customary to take 3½ per cent.

Mr. Ryde: But on this particular point, the difference between the 3 and 3½ per cent. table would be very small, wouldn't it?

Sir John Snell: Yes, about £80, certainly under £100.

Mr. Ryde: If you were dealing with something to-day, what would be your figure?

Sir John Snell: To-day I should take it certainly at 4½ per cent.

Mr. Ryde, K.C., addressed the Court on behalf of the Borough of Kensington, and submitted that the assessment was amply justified. As regarded Sir John Snell's tables for renewals, Counsel argued that the position depended not on prime cost, but the cost of producing an efficient substitute.

Mr. Macmorran, K.C., for the electricity company, said that whereas the gross receipts of the company were substantially the same, the expenditure had increased, and this made a difference of £3,876 in 1915. That loss accrued to the company despite that increased charges were operating for nine months of the year. He submitted that the assessment which it was sought to impose on the appellants was excessive, and not in accordance with the true principles of assessment. He urged that it should be remembered that in the case of electricity companies there were serious possibilities of litigation from time to time. Mr. Eve's gross value worked out at £22,995, which was £195 more than the Assessment Committee's valuation. As regarded Sir John Snell's figure of £68,000 instead of the prime cost, counsel contended that they could not ignore conditions as they existed to-day.

The Deputy-Chairman, in announcing his decision, said he had gone into all the figures connected with the case with considerable care, but he did not think any useful purpose would be served by his now going into them in detail. The decision he had come to was that the gross value should be reduced to £19,778, and the rateable to £11,378, and as that was a substantial reduction—a very considerable reduction—and as the appellants could not get it reduced without coming there, the respondents should pay half the appellants' costs.

Christie *v.* Nobles' Drug Stores, Ltd.

In the Lord Mayor's Court, last week, before the Recorder (Sir Forrest Fulton, K.C.) and a jury, Mr. J. C. Christie, electrical engineer and contractor, of Mansell Street, Aldgate, E., sued Nobles' Drug Stores, Ltd., of Well Street, Cable Street, E., and Whitecross Street, E.C., for £20 1s. 8d., work done and material supplied in May and June, 1915.

The plaintiff's case was that in May of last year an order was received from the defendants for a Blanchard incandescent lamp, and at the same time a discussion took place concerning an electric light installation to be fitted at defendants' Whitecross Street establishment. The plaintiff did the work, and sent in his bill of charges. At first he was promised payment, but afterwards defendants suggested that there were overcharges in the bill. Plaintiff replied that owing to the increase in the price of labour and material, he could not see his way to reducing the account more than 5 per cent. The money had not been paid. Evidence was given by the plaintiff's traveller (Mr. Hart), who spoke to taking the orders. He said it was not true, as now suggested, that he was shown an estimate given by the Electrical Installations, Ltd, and had agreed to do the electrical work at the price contained in the estimate.

For the defence, Mr. Willam Noble, secretary and managing director of the defendant company, was called, and he said the plaintiff's traveller had agreed to supply a Blanchard incandescent lamp for £3 2s. 3d., and to do certain electrical work at the price of £8 15s., the amount of an estimate he had received. He had always been ready and willing to pay those sums amounting to £11 17s. 3d., but he had been charged £20 1s. 8d. When he pointed the matter out to the plaintiff's traveller, he said there had been a mistake, and he (defendant) had been charged for a time job instead of a contract job. The traveller had promised to arrange matters.

The jury, after hearing further evidence, found for the plaintiff for £18 15s. 1d.

Commercial Cable Co. *v.* The Government of Newfoundland.

This matter, which was before the Judicial Committee (Lord Chancellor, Viscount Haldane, and Lord Atkinson) on Monday, was an appeal from a judgment of the Supreme Court of Newfoundland, which, by a majority, dismissed a claim by the appellants against the Government of Newfoundland for payment of two sums of $12,000 and $10,916.13. The claim was based upon the provisions of an agreement under the Great Seal of Newfoundland, dated February 18th, 1909, between the appellants, an American company, and the Governor of Newfoundland in Council. By the agreement the company agreed to establish a cable station at St. John's, Newfoundland, for the transmission of cablegrams to and from Great Britain and Ireland, the Government undertaking to pay them $4,000 annually for the advantages and facilities secured to it by the cable. Subsequently there was a change of Ministry in Newfoundland, and the new Administration declined to recognise the validity of the agreement on the ground that it had not been submitted to the Legislature of the Colony for its approval. The Chief Justice of Newfoundland dissented from the judgment of the two other judges of the Supreme Court, who dismissed the appellants' claim.

According to the report in the *Daily Telegraph*, appellants contended that the agreement was valid and binding upon the Newfoundland Government, and did not require the sanction and approval of the Legislature. On the part of the respondents, however, it was argued that the power of the Governor in Council to make contracts was limited by the rules of the House of Assembly made pursuant to the Representative Act, 1892, but the appellants contested that view, and contended that no rules established by the House of Assembly could have that effect.

Lord Haldane now delivered the judgment of the Judicial Committee, in which their Lordships intimated that they would humbly advise his Majesty that the appeal failed, and should be dismissed with costs.

WAR ITEMS.

Controlled Works.—The number of establishments now controlled by the Ministry of Munitions is 4,052; 124 have been added since the last announcement was made.

To be wound up.—The Board of Trade has ordered the following to be wound up under the Trading with the Enemy Amendment Act:—

Glastos, Ltd., 4, Charles Street, Hatton Garden, E.C., glassware merchants. Controller: H. Hartley, 70a, Basinghall Street, E.C.

Charles A. Muller, 10, Arcade, Westgate, Bradford, electrical accessories merchant. Controller: Walter Durrance, 12, Duke Street, Darley Street, Bradford.

Books for Prisoners of War.—The recent revelations respecting the condition and needs—physical and mental—of some of the British prisoners of war interned abroad, coupled with the recently imposed restrictions on the transmission, by private individuals, of any printed matter to enemy or neutral countries, make it more important than ever that friends and correspondents of our interned men, when writing to them, should acquaint them with the existence of an Educational Book Scheme under which they can get their wants supplied. Under this scheme any such prisoner can obtain, free of charge and carriage paid, good books of an educational character (not fiction or light literature) on almost any subject for reading or private study during his internment by communicating (either directly or through a correspondent) with Mr. A. T. Davies, of the Board of Education, Whitehall, London, S.W. Prisoners are invited to state as precisely as possible on a form (which can be had gratis on application) what kind of books they desire. The evidence that has already reached this country shows that it is necessary to provide not merely physical, but also mental, sustenance for British prisoners during their confinement—and this the above Educational Book Scheme aims at doing. Offers of suitable books for the latter will be gladly received by Mr. Davies, but they should be accompanied by a submission of the list of books proposed to be contributed.

Exemption Applications.—At the City of London Tribunal, on Friday, Mr. F. Shaw, who stated that he was in the employ of the British Thomson-Houston Co., Ltd., electrical engineers and manufacturers, made an appeal for exemption on business grounds. The applicant said he was appealing personally, as his employers would not make any appeals on patriotic grounds. The Clerk: "It is impossible for an applicant to say that he is indispensable if his employers do not appeal." The Chairman said there was no case made out, as the applicant claimed on business grounds, and his employers would not appeal. The claim would be disallowed. A claim on domestic grounds was made by Mr. H. C. Rodgers, also in the employ of the British Thomson-Houston Co., and the matter was referred to the applicant's local Tribunal.

At Rochdale, temporary exemption for one month was granted to Joseph Holroyd (33), armature winder and general electrical worker for the Sutcliffe Electric Company, with a view to enabling him to get work which would justify the authorities in giving him a badge.

At the City of London Tribunal, last week, an appeal for exemption was made on behalf of D. R. F. Dobson (35), an electrical fitter, and married, by Messrs. Walter Mossop and Co., electrical contractors. A partner of the firm said that they were supplying electrical fittings to firms occupied with war work. Dobson was specially experienced in the arrangement and control of dynamos, and was at present, and would be for the next three months, employed at a factory which was making munitions for the French Government. The firm did not know how they would be able to replace him. He was the only man of military age. The Chairman said that the man was included in the list of certified occupations as it now stood and came under the heading of "Electricians and electrical fitters," but, of course, the firm ran the risk of losing him if the list was altered.

At the Middlesbro' Tribunal, the electrician of the Grand Opera House was granted exemption on condition that he undertook work of national importance.

On the appeal of the Town Clerk, Mr. W. H. Wakefield (38), chief clerk at the Bexhill-on-Sea Electricity Works, has been conditionally exempted for three months.

Before the Axbridge Rural Tribunal, Mr. J. Winter Bobbett, Chairman of the Winscombe Electricity and Power Co., Ltd., applied for exemption for an engine-driver at the supply station named Hill, who is 41 in September. He stated that their customers numbered 130, and Hill had sole charge of the engine. Conditional exemption was given.

At the Keighley Tribunal, the Corporation claimed that a railless-car repairer was indispensable, and the question was adjourned for further consideration.

At the Southwark Tribunal, Hotton and Hodgson, electrical and lighting engineers, applied for the exemption of Mr. Fred Hotton, son of one of the principals, described as an engineer, and for an electrical fitter and engineer. Mr. Hotton, senr., stated that the firm had undertaken a contract from the War Office on the distinct understanding that they would get badges for their men, but they had not yet received them. Conditional exemption was granted in both cases on joining the Volunteer Training Corps.

Before the East Kent Appeal Court, ten employés were appealed for by the Chatham Light Railways Co. A month ago the cases were adjourned for a conference with the military; 26 cases were settled by arrangement, and the military did not oppose conditional exemption for the ten men before the Tribunal. The Chairman said that the men would be exempted until October 31st only, and leave to go before the Central Tribunal was asked for, on the ground that the arrangement entered into should be confirmed. Leave to appeal was refused.

At Grantham, application was made by the Electric Co. for the exemption of the sole manager, Mr. John E.

Edmundson (37), who also manages the works at Stamford and is visiting engineer at Cromer. Conditional exemption was granted.

Carlisle Tribunal, on the application of the military representative, has sanctioned the calling-up of Thos. Young, electrician at the works of Messrs. Carr, who said that they were increasing their electrical installation, and needed the man's services.

At Hitchin, application was made for exemption for Mr. J. Oppermann (40), manager of the Alexandra Electrical Engineering Co., Ltd., of Letchworth, who stated that all the employés had gone, and that he was carrying on the business with the aid of his two eldest daughters. Conditional exemption was granted.

Before the East Kent Appeal Court, on July 26th, the military representative appealed against the decision of the Whitstable Tribunal allowing conditional exemption to Mr. Arthur Stewart (32), engineer to the Whitstable Electrical Co., Ltd. After hearing the facts the appeal was dismissed, and the exemption confirmed.

At Lewisham, S.E., on July 21st, Mr. Hanson, electrician, appealed, and stated that he was willing to enter the Army for his profession, or in the Air Service, so that his wife could have larger means. He had, however, failed to get into the Royal Naval Air Service. No exemption was given.

Before the Redruth Rural Tribunal, on July 22nd, exemption was claimed for the cost clerk and the cashier of the Cornwall Electric Supply Co. The former has been with the company for five years and the latter, who is also in charge of the tramcar depôt, for 13 years. Mr. Smith stated that they had lost a lot of their technical staff, and had to keep the concern going. As the company's employés had been previously dealt with, the military representative objected to the applications, the men not having been included in the previous list. Mr. Peter: "You can't pick up a cost clerk in ten minutes." The Tribunal allowed the cost clerk six months, but refused the other application.

The East Sussex Appeal Court has refused exemption to the electrician of the Eastbourne Pier Co., aged 30, stated to be the only capable man employed.

Maidenhead Tribunal, on July 25th, gave Mr. Arundell, electrical engineer, leave to renew an appeal for Walter Sibley, the only man applied for, and who is engaged on power work and on occasional Government contracts.

At East Grinstead, an electrical fitter in business at Forest Row, who has work at four military hospitals, was given one month's exemption without leave to apply again.

Extended exemption has been refused at Brighton to an electrician with a local firm, who pleaded that they had had to refuse work owing to their depleted staff. The man has already had three months' exemption.

At Folkestone, Mr. E. Morgan, electrician, appealed, and it transpired that he had offered his premises to the Minister of Munitions, who, however, could offer him no work. Conditional exemption was allowed, with the stipulation that appellant joins the Volunteer Training Corps.

At Buxton, on July 27th, a firm of electrical engineers appealed for their foreman fitter, who assists at the electricity works. Exemption was allowed until January 28th.

BUSINESS NOTES.

Empire Contracts: An Australian Criticism.—In a recent editorial, entitled "How Not to Treat British Tenderers," the *Australian Statesman and Mining Standard* writes as follows:—

"That something should be done to prevent large orders going out of the Empire, when they can perfectly well be executed within the Empire, has long been obvious. We are not going to say that an order must be placed within the Empire under any circumstances that may arise, but, where work can be fulfilled by an Empire firm at no greater cost than by an alien firm, the Empire firm should certainly have the preference. That is not the feeling, apparently, of the City Electric Light Co., Ltd., Brisbane. This company issued specifications, which closed in September of last year, for rotary converters, transformers, &c. The value of the business in round figures was something between £12,000 and £15,000. Several British manufacturers tendered, and so did the Australian General Electric Co., which put forward apparatus manufactured by its principal, the General Electric Co., of New York. The British tenders were unsatisfactory in only one respect: though the manufacturers thought they would be able to carry out the work in a reasonable time, they were not willing, in view of the war conditions prevailing, to accept penalties for late delivery. This question of delivery was used as the main excuse for placing the order with the Australian General Electric Co. for the American apparatus, with the result that, at a time when money is of enormous importance to the Empire, a sum of something like £15,000 goes outside it when it might reasonably be spent within it. More recently the same company called tenders for further apparatus, consisting of a large turbo-alternator unit, the tenders being returnable March 1st. Although the conditions were just what they were before, the British firms were again invited to tender, and did so, and representatives of some of these companies were later invited to meet the manager of the company to discuss their tenders. When these interviews took place, the demand for guaranteed delivery under penalty was made once again, with the result that an order for a plant worth something like £30,000 has been placed with the Australian General Electric Co., to be passed on to the British Thomson-Houston Co., the turbine to be provided by the British Thomson-Houston Co., the alternator to be built by the General Electric Co., of America, and the condensing plant to be made by W.H. Allen, Sons & Co., Ltd. The Australian General Electric Co. appears to have accepted the penalty for delivery, so that the plant may be operating under steam, in Brisbane, on May 1st, 1917, though it is obvious that the British Thomson-Houston Co. is in precisely the same position as all other British manufacturing companies in the matter of delivery."

Our contemporary goes on to suggest that, inasmuch as the Brisbane Electric Light Co. will probably have to issue new shares in order to pay for this plant, the Treasury should refuse leave to call up the money, if it should appear that the money is to be spent in America. "The flow of money to America for munitions is sufficiently large at the present moment to make exchange a difficult enough matter, without having orders placed in the United States for apparatus which can, and ought to, be bought within the Empire. The prices offered by the English makers are understood to be at least as good as the American prices, and the failure to accept the penalty for failure to deliver by a specified time should not, in present circumstances, be regarded as sufficient excuse for spending this money outside the Empire."

U.S. Electrical Exports.—The American *Electrical Review and Western Electrician* states that the U.S. electrical exports for the month of April, 1916, were valued at about 28 per cent. more than in the corresponding month of 1915, although somewhat less than the high values of last February and March. The volume or quantity of the export trade has probably not materially increased over last year, the increase in total value being due almost entirely to the high prevailing prices. Quantities are given in the official reports for only four classes of electrical shipments, which in April compared as follows:—

Articles.	Numbers exported in— April, 1916.	April, 1915.
Electric fans	3,419	4,523
Arc lamps	22	35
Carbon-filament lamps	45,818	248,338
Metal-filament lamps	740,657	196,725

The values are as under:—

Articles.	April, 1916.	April, 1915.
Batteries	$168,142	$88,372
Dynamos or generators	151,727	127,071
Fans	45,528	61,926
Insulated wire and cable ...	386,239	354,344
Interior wiring supplies, &c. (including fixtures)	44,805	67,605
Lamps—		
Arc	639	554
Carbon-filament	5,410	27,665
Metal-filament	128,734	36,936
Meters and other measuring instruments	52,255	69,835
Motors	272,261	193,802
Telegraph instruments (including wireless apparatus) ...	7,965	14,377
Telephones	52,064	89,730
Transformers	68,889	47,763
All others	1,245,511	875,395
Total	$2,630,169	$2,055,375

For the first 10 months of the last three fiscal years, ended on April 30th in each case, the electrical export totals were as follows:—

Ten months of fiscal year.	Electrical Exports.
1913-14	$21,569,687
1914-15	15,922,467
1915-16	23,666,267

These totals do not include electric locomotives, which for these three 10-month periods totalled as follows:—1913-14, $272,387; 1914-15, $249,096; 1915-16, $422,340. During last April five such locomotives, valued at $26,964, were exported.

Prohibited Swedish Exports.—The Swedish Government has prohibited the exportation from the country during the war of "mountings for incandescent lamps, with or without switches, with coverings or inner parts of other metal than iron."

Japanese Government Subsidy for Electrical Exports.—From a statement quoted in the *Hochi*, it seems that the Japanese Government is going to subsidise the export of electrical apparatus. The Tokyo paper, which is regarded as the organ of the Government, credits an authority in the Department of Agriculture and Commerce with the following statement:—"Japan's electrical industry has recently undergone a marked development. Efforts should be made to further national interests by promoting the export of the various products of the industry. The Government is therefore considering means to encourage the export of electrical apparatus to China, India, and other accessible places. A new item of expenditure is to be provided in the next Budget for the purpose of subsidising the export. The scheme, however, has not yet been considered by the Cabinet in detail.—*Eastern Engineering.*

Catalogues and Lists.—Igranic Electric Co., Ltd., 147, Queen Victoria Street, London, E.C.—Illustrated leaflet No. 1,621, containing full descriptive particulars and tabulated ratings of magnetic couplings, clutches, and brakes.

Mr. George Ellison, Victoria Works, Warstone Lane, Birmingham.—New list, No. 327 (34 pages), dealing with totally-enclosed brake solenoids. Most exhaustive information—descriptive, tabular, and diagrammatic—is given regarding this type of gear, the contents being the result of many months' careful calculation and research. Some typical specifications are given, which have been found absolutely necessary owing to the fact that more than 50 per cent. of the inquiries received do not give sufficient particulars.

The Macintosh Cable Co. Ltd., 176, Rice Lane, Walton, Liverpool.—Pamphlet describing the Bowden-Thompson patent system for the protection of electric cables.

The Metallic Seamless Tube Co., Ltd. Wiggin Street, Birmingham.—64-page catalogue, giving illustrations, particulars, and clearly-arranged prices of "Metallic" steel conduits and fittings, enamelled and galvanised respectively. Copies may be had by the trade on application.

The Electric Suction Cleaner Co., 56, Victoria Street, London, S.W.—A 12-page pocket pamphlet, entitled "The New Maid," tells a story—and a very attractive one, too—of war-time domestic difficulties, and how electricity solved them by the aid of a "Clarissa" electric housemaid, otherwise a "Premier" suction cleaner.

Board of Trade Inquiries.—The B. of T. Commercial Intelligence Branch has received applications from Home firms for the names of manufacturers and producers of electrolytic plant for the manufacture of caustic soda; also for machines for cutting and pressing peat for fuel.

Electric Light Switching.—As the result of a recent supplementary competition and examination on this subject, held by Messrs. A. P. Lundberg & Sons, 9 Advanced, 30 Intermediate, and 36 Preliminary Certificates have been awarded, the foremost place being gained by Mr. H. F. Ware, of Macclesfield. Though the number of competitors is small compared with those in the recent record examination, it is really good, considering the present circumstances.

For Sale.—The Postmaster-General is offering for sale certain plant and machinery at the Post Office Parcels Depôt, Dublin.

The Receiver for the debenture-holders of the London Electron Works Co., Ltd., is inviting offers for the sale by tender of the land, factory, plant, &c., at Regent's Dock, E.

Messrs. Wheatley Kirk, Price & Co. will offer for sale by auction, on August 22nd, the plant of the Holloway Electric Supply Co., Ltd. Particulars appear in our advertisement pages to-day.

Book Notices.—The Swedish Chamber of Commerce for the United Kingdom (5, Lloyd's Avenue, London, E.C.) has issued a *Year Book* of the Chamber for 1915. It contains a copy of the annual report, and articles on Swedish shipping during the war, Swedish oversea steamship lines (with map), the Swedish route to Russia (with map and plan), statistics of trade between the United Kingdom and Sweden during 1914, &c. There are a number of trade reports treating with the principal markets for Swedish staple articles in the United Kingdom from an individual point of view. Innumerable charts are given, many of them showing the imports and exports of the United Kingdom for different classes of electrical manufactures during five or six years prior to the outbreak of war.

"Lektrik Schémas de Lumière," is the title of a French translation of their "Lektrik Lighting Connections," which Messrs. A. P. Lundberg & Sons, with characteristic enterprise, have just issued (price 1 fr.). The contents, which have been adapted by M. R. Drilhon, one of the firm's advanced-grade certificate-holders, are in substance identical with those of the English edition; the total number printed, including the French edition, is now no less than 37,000 copies, a fact which speaks for itself.

The July issue of the *Journal* of the Tramways and Light Railways Association contains a full report of the proceedings at the recent annual congress of the Association.

Post Office Electrical Engineers' *Journal*. Vol. IX. Part II. July, 1916. London: H. Alabaster, Gatehouse & Co. Price 1s. net.

"Programme for the Session 1916-17" of the City and Guilds of London Institute, Department of Technology." London: John Murray. Price 9d. net.

"The Slide Rule." By C. N. Pickworth. Manchester: Emmott and Co. Price 2s. net.

The British-Italian Corporation.—In the House of Commons, on Monday, according to the *Financial Times*, Sir Archibald Williamson asked the Chancellor of the Exchequer if he was in a position to give any information with regard to the formation of a company to promote the joint economic interests of this country and Italy, and if he could state what financial assistance, if any, was being provided by the British Government.

Mr. McKenna, in reply, gave particulars of the British-Italian Corporation, Ltd., concerning which we gave details in our last issue. He added that the British Government agreed to contribute to the company, by way of subsidy, during each of the first 10 years after its incorporation, an annual sum of £50,000, or the equivalent of 5 per cent. upon its paid-up capital if less than £1,000,000. In consideration of the subsidy, the company agreed to pay to the Government amounts equal to any dividend above a cumulative dividend of 5 per cent. per annum which the directors might distribute to the shareholders in any year after making such provision as the directors might think desirable for bad and doubtful debts and the establishment of a reserve fund, until by such means the Government had been repaid (without interest) the amount so received by the company by way of subsidy. He proposed to ask Parliament to give covering authority for the subsidy in the next Government War Obligations Bill. A company under the style of the Compagnia Italo-Britannica would forthwith be formed under Italian law, with a capital of 10,000,000 lire (£400,000), one-half of which is to be taken by the British Italian Corporation and the other half by the Credito Italiano and its friends. Out of the nine directors of the Italian company three would be British. The two companies would work together in close collaboration, and arrangements had been made by which their interests would be as far as possible identified, except that the subsidy of the British Government would naturally remain for the benefit of the British company exclusively. The primary object of the two companies is the development of economic relations between the British Empire and Italy and the promotion of undertakings in the commercial and industrial fields in Italy. They would carry out banking and financial operations which did not necessarily fall within the strict definition of banking as understood in this country.

The questioner also asked Mr. McKenna whether he was prepared to consider similar arrangements with respect to Russia, and, according to the *Morning Post*, he was understood to assent.

New Building and Engineering Work.—In connection with the new Order in Council restricting building and engineering work above a certain value, without licence from the Ministry of Munitions, it is explained that work which was in progress before July 20th need not be stopped pending the granting of a licence. Any building commenced before that date should be continued until such time as a licence should be definitely refused. There is no desire to restrict building unless a national purpose can thereby be served. The principal purpose of the Ministry is to limit the use of structural steel. A further purpose is to assist the Ministry of Munitions in obtaining such building labour as is urgently required upon munition factories.

Trade Announcement.—Messrs. Ward & Goldstone desire to remind the trade that their London address is Albion House, 59-61, New Oxford Street, W.C.; Telephone No.: "Museum 2988."

Dissolutions and Liquidations.—Adnil Electric Co., Ltd.—August 16th is the last day for creditors to prove their debts or claims. Mr. J. H. Stephens, 6, Clements Lane, E.C., liquidator.

T. W. Thompson & Co., electrical engineers, Endyne Works, Blissett Street, Greenwich.—Messrs. T. W. De Lasaux and E. J. V. Pucknell have dissolved partership. Mr. De Lasaux, 39, London Street, Greenwich, will attend to debts, &c.

LIGHTING AND POWER NOTES.

Australia.—A scheme for the electric lighting of Murwillumbah (N.S.W.) has been approved by the Municipal Council. Application will be made to the Government for permission to borrow £7,480 for carrying out the scheme if the consent of the ratepayers is obtained.

Two of the six 15-ton high-speed electric cranes to be installed on the new wharf at Newcastle (N.S.W.) have been tested in position. These are for coal shipping purposes, and the tests showed a hoisting speed of 98 ft. per min., a slewing speed at 55 ft. radius of 433 ft. per min., and a travelling speed of 134 ft. per min. The cranes were manufactured by Messrs. Cowans, Sheldon & Co., Carlisle, to the designs of Mr. Percy Allan, Assistant Director-General of Public Works.

A fire occurred recently at the Adelaide (S. Aust.) Corporation electricity works at Jamestown; the power house was completely destroyed, also much of the plant.

In connection with the installation of an electrical pumping plant at Bendigo (Victoria), for the drainage of certain portions of the goldfields, arrangements have been made with the Electric Supply Co., of Victoria, for the supply of the necessary power.—*Tenders.*

With a view to testing the value of mountain streams for generating electric power, the N.S.W. Government has in hand a small scheme at Jenolan Caves. The work has been proceeding for some time, and is now almost completed. The scheme is to provide lighting for the Caves House, the caves and the various buildings, and to provide power for heating and other purposes.

Aldershot.—Year's Working.—There was a deficit of £204 on the working of the electricity undertaking for the year ended March 31st last, partly attributed to heavy law costs, which had been met out of revenue. The total revenue for the twelve months amounted to £8,128, as against an expenditure of £6,153, leaving a gross balance of £1,975. The units generated totalled 676,220, an increase of 58,384.

Argentina.—The "Inspecoion General de Rentas" has been authorised to make arrangements with the Luz y Fuerza and Anglo-Argentina Companies for the supply of electric light at the port and dependencies of Paraná and Concepcion del Uruguay respectively.—*Review of the River Plate.*

Barrow.—Proposed Loans.—The T.C. is to apply for sanction to borrow £10,300 for electrical extensions in Walney Island ; tenders are to be obtained for an electric lorry.

Bridlington.—Year's Working.—The annual report of Mr. F. Ffrench, the deputy electrical engineer, for 1915-16, shows a gross revenue of £5,766, as against £7,606 ; gross expenditure amounting to £2,989, compared with £3,841 ; and a gross profit of £2,776, as against £3,764. Interest and repayment charges amounted to £4,077, leaving a deficit of £1,321, which will be taken from reserve. During the year, the works have generated 260,000 units less than in 1913, and 150,000 less than in the previous year ; the plant was closed down 15 times owing to war conditions.

Brighton.—Year's Working.—The detailed figures of the Corporation electricity undertaking for 1915-16 show that a deficit of £3,990 resulted on the year, as against a deficit of £1,354 in 1914-15. The total revenue amounted to £93,397, which was in excess of the previous two years' revenues, and obtained on 9,336,639 units sold, as against 10,214,436 units sold in 1914-15. A considerable increase occurred in expenditure, and the gross profit of £40,345 represented a drop of over £2,000 on the year. Interest amounted to £17,760 and sinking fund to £24,908, leaving the balance as shown. The coal bill increased by £9,000 to a total of £25,760 (average cost now 32s. per ton), despite decreased output and increased efficiency (3·83 lb. per unit sold as against 3·97 lb. in 1914-15). The deficiency is charged to the reserve fund. Owing to the extinction of the public lamps, the ratepayers saved some £7,000 during the year on that account, although the undertaking had to meet capital charges on plant as usual.

Bury St. Edmunds.—Year's Working.—Mr. S. E. Day, the borough electrical engineer, in his report for the past year, states that there has been a decrease in the units sold of 27 per cent., and that the demand for electricity for power purposes exceeded that for lighting, being an increase of 17 per cent. over 1914-15. The cost of production was £3,089, and the income £4,696, leaving a gross profit of £1,608. Mr. Day points out the necessity for replacing either, or both, of the 60 kw. generating sets by a larger and more efficient unit. The new storage battery has been working satisfactorily, and the reduction during the past year of 406 tons of coal consumed is almost entirely due to its use. The "free wiring scheme" inaugurated two years ago has been the means of introducing electric light into premises which otherwise would not have been secured, owing to the installation difficulty.

Chelmsford.—Street Lighting.—On condition that the Electric Supply Co. withdraws opposition to the Council's application to extend for a year the option to purchase the undertaking, the T.C. has decided to enter into a new four years' contract for public lighting from April 1st, 1916. For such time as the lamps are not used there is to be a yearly payment of £150, and there are to be 14 500-watt "half-watt" lamps, instead of arc lamps, at £20 per annum each, 44 double lamps for street corners, and 190 single lamps, at £3 15s. each. From June 1st, 1915, to March 31st, 1916, when no lamps were used, a payment of £275 is to be made. The contract price for that period was £1,375.

Continental.—Spain.—Evidence of the progress in the production and consumption of electricity in Spain is furnished by the report of the Sociedad Hidroelectrica Espanola, for the year 1915, which shows that supply for lighting has undergone an enormous increase. The company supplies Cartagena, Alicante, Alcoy, Valencia and Madrid, and the output in 1915 was 103,254,203 units, contrasted with 96,707,646 units in the previous year. With the object of increasing the hydroelectric production, a new intake of water has been made on the River Guadazaon, a feeder of the Cabriel, which will make it possible to regulate the production at the Villora station. The available profits were 2,003,250 pesetas, the dividend being 8 per cent., and the carry over, 83,284 pesetas, after allowing sums to sinking fund, reserve, and employés' compensation.

Darlington.—The Electricity and Light Railways Committee has under consideration the question as to whether the price of electricity should be increased still further to meet the increase in the cost of coal. The Committee has decided to make a trial of seats for lady conductors on the tramway cars.

Ealing.—Price Increase.—The Corporation has decided to raise the charges for electricity by 33⅓ per cent. in September next ; already the charge has been increased by 20 per cent.

French Indo-China.—An American Consular Report mentions that only the important cities of Saigon, Cholon and Pnompenh in the south, and Hanoi and Haiphong in the north, are adequately supplied with electricity. The work is practically in the hands of La Campagnie des Eaux et Electricité de l'Indochine, a company with about 6,000,000 fr. capital. A plant of 5,000 h.p. at Coquan supplies both Saigon and Cholon, and includes a 2,000-h.p. turbine and high-speed engines. Small plants exist at Mytho, Battambong, Kompong-Cham, Kratie and Ventiane ; the Pnompenh plant is of 615 kw. The Hanoi plant is of 1,000 kw., and the Haiphong plant of 1,200 h.p. There are a number of private installations in use, and the Wolfram Co., of Tonkin, is installing a 1,000-h.p. hydro-electric plant at its mine.

Heywood.—Year's Working.—The report of Mr. R. B. Leach, the Corporation's electrical engineer, for the year ended March 31st last, states that the total income was £8,565, against £7,121 in the previous year. There was a debit balance of £940, plus £112 disallowed by the L.G.B. inspector at the last inquiry against a debit balance of £927 in 1914-15. The cost of energy purchased from the Bury Corporation was £1,714 ; and the units purchased were 405,077 for lighting and power, and 392,805 for traction, making, with the energy generated by the Council's plant, a total of 1,776,497 units. The engineer estimated that, except for the operation of the bulk supply scheme, the loss on the undertaking would have exceeded £3,000.—*Bury Guardian.*

Ilford.—Refuse Destructor.—The U.D.C. has instructed the engineer to prepare specifications for a h.t. alternating plant, with a view to utilising the steam at the refuse destructor. The cost is stated to be about £7,000.

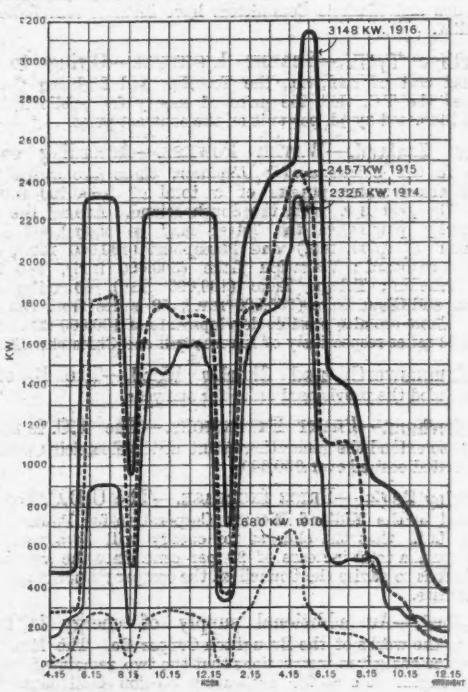
The Electricity Committee proposes to discontinue the discount of 5 per cent. at present allowed on accounts in cases of prompt payment. The electrical engineer has been instructed to communicate with certain authorities regarding the B. of T.'s circular *re* coal economy and inter-working.

India.—As expert opinion from the Tata Electric Works has been obtained to the effect that the city of Hyderabad is very favourably situated for an electrical installation to be worked by water power, the scheme will now be proceeded with.

The Darjeeling municipality proposes working out Mr. Stonebridge's hydro-electric scheme initiated by the late Mr. Robertson, at a cost of more than 4 lakhs ; the power station will be established at Singla, from where current will be supplied to Darjeeling town, the neighbouring tea gardens and Kurseong.—*Indian Engineering.*

The Government of Bengal has appointed a Committee to inquire into the rates charged for electric current in Calcutta, and the general question of supply. It is composed of the Hon. Mr. Y. Donald (president) and Mr. J. W. Meares, Electrical Adviser to the Government of India ; Mr. A. K. Taylor, Electrical Inspector, Bengal ; and Mr. Hales, Registrar of Public Companies, Bengal.—*Indian Textile Journal.*

Keighley. — Year's Working.—The report of Mr. Webber, the borough electrical engineer, contains as usual much interesting information regarding the last year's working of the electricity undertaking, which continues to make substantial progress. The bare figures show revenue amounting to £24,253 as against £18,394 in 1914-15 ; a gross profit of £8,689 against £8,013, and a net profit of £759 against £1,025 in 1914-15, this despite increased coal cost and financial charges. The total output sold was 6,769,612 units, of which power absorbed over 6,000,000 units ; the previous year's total was 4,942,850 units. Lighting units fell from 311,482 to 280,513, and Mr. Webber mentions that lighting supply has only increased about 168,000 units in 10 years, while power units have increased by 5,900,000 units during the same time. The tramway supply, however, increased from 311,710 to 424,393 units, due to the railless trolley system being in full operation. Some 8,852 h.p. of motors (exclusive of tramways) are connected, and we note that 22 h.t. and 35 l.t. large power consumers



Keighley Load Curves, 1910, 1914, 1915 and 1916.

now have 5 or 10-year agreements with the department. The generating plant capacity was 4,750 kw., but preparations are advanced for installing a further 5,000-kw. turbo-alternator, which will have the effect of reducing the present low capital cost per kw. of plant installed, of £22 to £18. The maximum load was 3,148 kw., and we note that the plant has been running night and day with prac-

tically no interruptions. The works and management cost amounted to ·55d. per unit (an increase of ·05d.), and the "all-in" cost to ·83d. per unit; the average price obtained for supply was ·86d. per unit, and private supply (which, in this case, practically means power supply) gave an average revenue of ·79d. per unit. Mr. Webber advises the installation of an induced draught plant to enable the five big boilers to give their full output; he also mentions that negotiations are probable with the Yorkshire Power Co., with a view to a linking-up scheme. We reproduce a set of load curves for various years, which show concisely the excellent progress made by this undertaking,

Keadby.—Electrically-operated Bridge.—A recent issue of the *Railway Gazette* briefly describes the new Keadby electrically-operated bridge, of the Scherzer rolling lift type, which was brought into use by the Great Central Railway Co. in May last. The lifting span weighs about 3,000 tons, and is said to be the heaviest bridge of the type constructed in Europe. The bridge carries both a railway and roadway, and is provided with a generating plant and battery houses on either side of the river, one for working the bridge mechanism and one for supplying the signal circuits which are interlocked with the latter.

Kendal.—Year's Working.—There was a gross profit of £880 and net loss of £390 on the working of the electricity undertaking for the twelve months ending March 31st last. The units generated amounted to 167,298, and 139,403 were sold. Notwithstanding the increased price of fuel, the cost per unit generated was reduced from 2·42d. to 2·37d.

Liverpool.—The City Council has approved the recommendation of the Electricity Committee that the provisions as to minimum supply in Messrs. Lewis's agreement be waived until 12 months after the termination of the war, subject to the agreement being extended for a corresponding period from that date. Similar concessions have been made to the railway companies.

London.—Bethnal Green.—The Borough Council's electric supply scheme is now nearing completion; as a matter of urgency, and informally, the supply of electricity was commenced to a limited extent on June 19th.—*East London Advertiser.*

Fulham.—The B.C. has received the sanction of the L.C.C. to the borrowing of £2,500 for electricity purposes.

L.C.C.—The Finance Committee recommends the Council's sanction to the borrowing of £3,728 by the Battersea B.C. for electricity purposes, and £650 by the Hammersmith B.C. for the purchase of a site for electricity purposes.

Manchester.—Rate Relief and Income-Tax.—The large contributions of certain of the municipal trading departments to the relief of the rates are to form the subject of consideration, notice having been given of a motion that, in view of the present high rate of income-tax, &c., a Special Committee be appointed to review the basis on which the Gas, Electricity, Tramways and Markets Committees have hitherto contributed to rate relief.

Merthyr Tydfil.—Street Lighting.—Owing to the increased cost of fuel, &c., the Traction and Lighting Co. has informed the T.C. that the price of energy for public lighting will be increased by ½d. per unit on the contract price.

New Zealand.—Water Powers.—According to an article in the *Commonwealth Engineer*, there are available in New Zealand water powers of a total of 3,800,000 H.P., of which 3,305,000 H.P. is in the South Island. Among the most noteworthy powers in the latter may be mentioned Lakes Te Anau (750,000 H.P.) and Manapouri (420,000 H.P.), both on the seaboard; Wakatipu Lake (500,000 H.P.), 140 miles from Dunedin; Tekapo Lake (400,000 H.P.), 40 miles from Timaru, and Ohau Lake (250,000 H.P.), 52 miles from the same town. There are also possible developments of 100,000 H.P. within 50 and 88 miles respectively of Invercargill and Christchurch.

Rickmansworth and Chorley Wood.—The B. of T. has extended the provisional order for one year.

Rotherham.—Plant Extensions.—The T.C. is recommended to extend the generating plant at the electricity works, at an estimated cost of over £50,000.

Rowley Regis.—Price Increase.—The U.D.C. has been informed by the Midland Electric Corporation for Power Distribution, Ltd., that the charges for energy will be advanced by 10 per cent., a total increase of 20 per cent. since the war started. The clerk is to advise the Council on the company's powers to make the increase.

Salford.—An additional supply of energy is to be given to the works of the Broughton Copper Co. The Electricity Committee has given instructions that the two remaining reciprocating engine sets at the generating station shall be sold, and the money realised credited to the depreciation and renewals fund. The Committee has accepted the offer of Mr. J. Heaton to supply 2,000 tons of Tyldesley slack at 17s. 11d. per ton.

Sevenoaks.—The Electricity Co. has applied to the U.D.C. for permission to run wiring for the supply of current to small dwellings on the "fixed-price" system, and the Council has decided to obtain information from Wimbledon, where a similar plan has been adopted,

Shipley.—Linking-up Proposal.—The Electricity Committee reported, with regard to the proposed linking-up with the Bradford electricity undertaking, that from particulars submitted it was thought that at present there was very little to be gained by interconnection; definite figures had not been submitted, and the Committee has deferred consideration pending its engineer's report.

Watford.—Price Increase.—The Council has decided to raise the flat rate for lighting to 5½d. as from the commencement of the September quarter until December 31st, when the matter will be reconsidered.

Willesden.—Year's Working.—The working of the Council's electricity undertaking for the year ended March 31st last, showed a gross revenue of £37,646, and expenditure amounting to £26,463, leaving a gross profit of £11,182. Loan and other charges amounted to £12,900, and the result was a deficit of £1,276, as compared with the previous year's deficit of £3,094. The output sold amounted to 4,829,979 units, or over 800,000 units in excess of 1914-15. The engineer estimates a surplus of £1,618 on the year ending March 31st next.

Wimbledon.—The chairman and vice-chairman of the Electricity Committee, with the town clerk and the borough electrical engineer, are to interview the L.G.B. respecting the Board's refusal to sanction loans for mains, house-services, meters, and transformers since March 31st, 1915. The question of increasing the price of electricity to ordinary consumers has been referred to the Standing Sub-Committee for consideration.

Worthing.—The T.C. has decided to have a Diesel engine at the electricity works fitted for the use of tar oil as well as petroleum residue. The cost is placed at £269.

TRAMWAY and RAILWAY NOTES.

Australia.—North Shore Railway Electrification.—The Deputy Chief Commissioner of Railways in New South Wales, in replying to a deputation, foreshadowed an early start in connection with the electrification of the Bankstown and Milson's Point-Hornsby lines. The Commissioner considered that funds would be available shortly for a start to be made, and stated that the Railway Department desired that a fair mileage of line might be in operation electrically before the opening of the City Railway, so that it might serve as a training ground for the staff which would be required for operating the more complex system within the city.—*Sydney Daily Telegraph.*

Victorian Suburban Railway Electrification.—Owing to the difficulty over the fulfilment of the electrification contracts, some of which are under negotiation for transference, and in view of the magnitude of the interests, the Government has authorised Mr. E. B. Jones, one of the Commissioners, to proceed to London to interview the Agent-General, Mr. Merz, and the contractors with a view to deciding on the course of action to be followed in the best interests of the State and of the electrification scheme. Any course of action recommended by Mr. Jones will be subject to the concurrence of the Government.

Bradford.—Electric Vehicles.—The Corporation is applying for permission to borrow £3,700 for the purchase of three electric tipping wagons.

Continental.—France.—A new electric tramway line from Neuilly to Suresnes, *viâ* Puteaux, in the department of the Seine, has just secured official approval as a work of "public utility."

Holland.—An American Consular report says that an electric railway is proposed from Amsterdam through the "Zaanstreek," a district traversed by the River Zaan. Fourteen towns will be joined by this new electric road. Its length and other particulars are not yet definitely settled.

Another new electric line is projected in the Provinces of Groningen and Drenthe, extending from the city of Groningen some 20 miles southward and touching several prosperous towns. As at present planned, the project will cost about £100,000. Both freight and passenger cars will be operated.

Switzerland.—An electric railway lately opened at Lenkerbad, in Canton Valars, was begun in 1912. The line is 12½ km. in length, and is constructed on the rack system.

Halifax.—Loan Sanction.—The Tramways Committee has received a letter from the Treasury agreeing to the borrowing of £2,700 for extensions at the tramcar depôt, Skircoat Road.

India.—Works are to be carried out on Chamundi Hill, Mysore, for a sanatorium. In this connection an electric tramway to the top of Chamundi is to be put in hand. The project is to be on similar lines to the Hong-Kong tramway, electrical power being used, so that before long this will be one of the most delightful attractions of Mysore City. It will represent a rapid climb of 1,000 ft. in roomy cars on the same principle as the line over the bluff at the Sivasamudram Falls.—*Indian Engineering.*

Ilford. — Halfpenny Fares. — The manager of the tramways undertaking has reported in favour of the abolition of the halfpenny fare; he points out that the receipts have not increased in proportion to the expenditure; the reserve fund is totally inadequate for future needs, and a loss is made on every halfpenny passenger carried. The manager is also of opinion that the undertaking has nothing to fear from the 'bus company continuing halfpenny fares; their schedule, the manager points out, will be ruined, and their long-distance passengers crowded out, therefore they will be bound to follow the Council's lead.

London. — L.C.C. Tramways and War Service.— The Highways Committee has reported on the services rendered by the Council's tramways in connection with the war; the redistribution of the services has been of the greatest assistance to the large numbers of workers engaged in certain industries of national importance. More than 11½ millions of passengers are being carried weekly by the Council's cars, the majority of whom use the tramcars in connection with the industry and commerce of London, and for travelling to factories in various parts of the area. In the Woolwich section in July, 1914, before the war, the maximum number of cars arriving at a certain point during the busiest half-hour was 41; this number has now been increased to 86, an addition of 110 per cent. The number of cars arriving at the same point each day before the war was 975, the number is now 1,595, an increase of over 63 per cent. During the busiest hour to-day accommodation is provided for 13,688 people, compared with 4,094 before the war, an increase of over 234 per cent. The accommodation provided by motor-omnibuses in this district, compared with that provided before the war, shows only a slight increase. To meet the present additional services the tramways sub-station at Woolwich has been enlarged, and additional cables installed; one section of the tramway track has been doubled, and at three additional points further doublings are in progress.

To-day 1,072 women conductors are employed on the Council's cars; the services of officers and employés have been lent to the Government for national work; substantial allowances have been made to the men enlisting involving a charge of over £168,700, which will be increased to over £260,000 by the end of the current financial year, if the war continues until March 31st, 1917.

The Highways Committee has recently received a report from its consulting engineers pointing out that to supply the new turbine plant it will be necessary to fit 10 boilers at the power station with larger grates. This will also enable a cheaper class of fuel to be used, and the Committee considers that an experimental installation should be made on four boilers immediately. The cost of the complete scheme is estimated at £5,000, which, it is expected, will be justified by the saving in cheaper fuel.

Halfpenny Fares.—The Highways Committee has been in communication with the Leyton and West Ham Councils on the question of halfpenny fares, which these Councils wish to abolish. The Committee has agreed to negotiate on the matter, which affects through running arrangements.

The Highways Committee recommends that application be made to the B. of T. for an extension of the time allowed for the construction of tramways authorised, and which have not been commenced, the powers for which will expire in August, 1917.

Woolwich.—The L.C.C. is to be informed that the Council is prepared to re-open negotiations for the laying of a double line of tramway track between Beresford Square and Parry Place, Plumstead, provided the County Council agrees to carry out the necessary street widenings within one year of the conclusion of peace.

Middlesbrough.—Tramway Purchase Inquiry. - The General Purposes Committee of the Corporation has had under consideration the position with regard to the local tramway—the powers of the Imperial Tramways Co. expiring in 1918—and has appointed a Sub-Committee to go into the whole question, and report to the Council as to the advisability of giving the company six months' notice of its intention to acquire the undertaking.

Newcastle.—Wages.—The Tramways Committee, last week, refused to grant its employés an advance of 2s. per week, on the ground that the change suggested would interfere with the arrangement ratified by the Committee on Production. The tramwaymen have accordingly decided to apply to the Committee on Production for an increase of wages of 5s. per week for all grades not catered for by skilled workmen's organisations, and also for women to be placed on the same wage basis as men.

North London Railway Electrification.—Further successful trial runs have been made over the recently electrified section of the North London Railway Co.'s system between Broad Street and Richmond; electric trains are to commence running on October 1st, and to save 15 minutes on the old time table.

Portsmouth.—Year's Profit.—The Corporation tramway undertaking secured a net profit of over £21,000 during the year ended March last; £13,000 is to be given towards rate relief.

Wolverhampton.—Year's Working.—The accounts of the tramway undertaking for the year ended March 31st last show a gross profit of £24,893. To this has been added the balance of £1,459 on the motor char-à-banc account, making a total of £26,353, which has been disposed of as follows:—Interest, £6,666; income-tax, £518; loans, £5,346; renewals account, £5,141; additions and improvements, £1,685; cost of repair work in 1916-17 (work suspended during 1915-16, amount carried forward), £2,477; in aid of borough rate, £4,018. The number of passengers carried during the twelve months shows an increase of just over a million, although the number of miles run shows a falling off of 24,718.

Wallasey.—Wages.—The proposed increases to the tramway drivers and conductors were confirmed at a meeting of the T.C., on July 27th, and an amendment that the women conductors should also share in the higher rates was defeated by a large majority.

TELEGRAPH and TELEPHONE NOTES.

Bolivia. — Radiotelegraphic communication has been experimentally established between Belem (Brazil) and Riberalta (Bolivia).—*Journal Télégraphique.*

Canada.—Four new cables have been laid in the Bays of Passamaquoddy and Fundy, from Eastport (Maine) to the Canadian Isles of Deer, Grand Manan, and Campobello.—*T. and T. Age.*

German Wireless Communications. — Wireless traffic between the United States and Germany, which has been interrupted during the past month owing to atmospheric disturbances, has been reopened.

Russia.—In the Government's Budget for the current year, provision is made for the expenditure of a sum of 5,140,000 roubles on the erection and repair of telegraph lines, as against 4,116,000 roubles in 1915. Similarly, the provision for the erection and repair of telephone lines has been increased from 2,890,000 roubles to 3,325,000 roubles.

Telegraph Construction Bill.—The first clause of the Telegraph Bill recently introduced into the House of Commons gives the Postmaster-General increased power to erect poles on, and carry lines over, private property, and the London County Council, considering that its rights as an owner of property would be seriously prejudiced, has decided to oppose the passage of the Bill. The Bill passed its second reading on Wednesday.

Time Signals.—The United States Naval Observatory states that the difference in the time signal between the Isthmus of Panama and the Arlington station is about ·02 second, and there is a lag of 0·27 second between the Isthmus and Key West, the latter being due to the various relays used in the commercial telegraph lines over which the signal comes from the Observatory. The error in the time signal sent from the radio stations is usually less than 0·1 second.—*T. and T. Age.*

Trans-Pacific Wireless.—With the satisfactory conclusion of the official tests between the high-power wireless stations at Funabashi, Japan, and Honolulu, the trans-Pacific scheme of wireless intercommunication is now complete. This service, stretching across some 6,300 miles of ocean, will be conducted between Funabashi and San Francisco, the station at Honolulu acting as a relay. The service between San Francisco and Honolulu has been in operation for some months. The Honolulu-Funabashi section, which has just received official approval, spans an interval hundreds of miles greater than the distance between Berlin and New York.

Wireless Direction-Finder.—According to the *Electrical World*, the U.S.A. Bureau of Standards has developed a simple apparatus for determining the direction of origin of wireless signals, of great sensitiveness, and less affected than ordinary apparatus by atmospheric conditions and by waves emanating from other stations. The device is used indoors and has no antenna, no earth connection, and no communication with the exterior. Besides its use on board ship for determining the direction of a lighthouse or lightship equipped with wireless apparatus, it is suitable for military purposes as a receiver, being perfectly portable, and can be used for determining the position of amateur wireless stations which fail to observe the regulations, and thus interfere with official messages.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Sydney.—August 24th. P.M.G. Automatic switchboard and apparatus for North Sydney Exchange. Schedule No. 511.*

September 20th. N.S.W. Government Railways. One 50-ton electrically-operated overhead travelling crane for Zara Street power house, Newcastle. October 11th. One motor-driven air compressor for Zara Street power house. Electrical Engineer, 61, Hunter Street.

Perth.—October 4th. Deputy P.M.G. Telegraph and telephone measuring instruments and parts. Schedule 501 W.A.*

Barking. — August 15th. Electricity and Tramways Committee. Cables, switchgear, and transformers. See "Official Notices" July 28th.

Castlebar.—August 5th. U.D.C. Street lighting by electricity. Clerk to the Council.

France.—August 18th. The State Railway authorities in Paris require an electric transporter for locomotives at Vaugirard depôt.

Glasgow.—The Clyde Navigation trustees have decided to invite tenders for three 10-ton electric cranes and grabs.

London.—L.C.C.—The Highways Committee recommends that tenders be invited for the provision of additional switchgear required in connection with the third new turbo-generator at the Greenwich generating station, and that the chairman and vice-chairman be severally authorised during the summer recess, 1916, to open any tenders that may be received for the work.

New Zealand.—Invercargill.—September 28th. Borough Council. Steam turbo-alternator, condensing plant, and switchgear. Specifications from the Tramway Office. Contract No. 40.*

Dunedin.—September 6th. City Council. Oil filtering and drying plant. Plans and particulars from City Electrical Engineer. —*New Zealand Shipping and Commerce.*

Rochdale.—August 9th. Electricity Committee. Steam coal. Mr. C. C. Atchison, Engineer and Manager, Dane Street.

St. Asaph.—August 16th. Guardians of St. Asaph Union. Renewal of accumulators. See "Official Notices" to-day.

Spain.—August 29th. Municipal authorities of Porzuna (Province of Ciudad Real). Concession for the electric lighting of the town for 30 years.

September 1st. The Departmento de Fomento and the Mancomunidad de Cataluna, at the Palacio de la Generalidad, Barcelona. Establishment of interurban telephone lines between Granollers and Vich, and also between Igualada, Santa Coloma and Vallfogona.

Tenders are also about to be invited for the establishment of interurban telephone lines between Crida, Balaguer, Tremp and Sort, and between Manresa, Cardona and Solnoma.

Specifications for the items marked * can be seen at the Board of Trade Commercial Intelligence Branch in London.

CLOSED.

Australia.—The following tenders have been accepted:—

P.M.G.'s Department, Queensland:—
One Gardner oil engine and generator; Phœnix dynamo, £237; power board, £145; 330 Chloride accumulators, 65 a.h. capacity, £415.—United Electric Light Co., Ltd.

P.M.G.'s Department, South Australia:—
Two motor-driven Wheatstone transmitters, £99 10s.—India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.
One common battery multiple switchboard.—Western Electric Co. (Australia), Ltd., £5,449.

P.M.G.'s Department, West Australia:—
Twelve miles twisted pair O.S. distributing wire, £281.—Western Electric Co. (Australia), Ltd.

P.M.G.'s Department, Victoria:—
Four tons Wheatstone tape, £464.—Creed, Bille & Co., Ltd.

Victoria, State Coal Mine:—
Electric lamps, half-watt 6·6 amp., 10s. each.—Australian General Electric Co.

Metropolitan Board of Water Supply and Sewerage, Sydney:—
Electric motor for Prospect & Sherwood pumping plant, £580.—N. Guthridge, Ltd.—*Tenders.*

Barrow-in-Furness.—Accepted tenders:—
Switchgear.—Ferranti, Ltd., £185.
Sub-station switchgear.—British Thomson-Houston Co., Ltd., £470 and £239.
Rotary converter.—British Westinghouse Co., Ltd., £735.
Overhead crane.—Herbert Morris, Ltd., £68.
Sub-station at Walney Island.—Mr. J. Neal, £530.

Bolton.—Tramways Committee. Hadfields, Ltd., for points and crossings.

Bradford.—Tramways Committee. Messrs. Clay and Atkinson are to continue to supply phosphor bronze castings until December 31st next, at an increase of 4½d. per lb. on the schedule price.

China.—According to the *North China Daily News*, Messrs. Anderson Meyer & Co., Ltd., have received an order to supply a complete lighting plant for Urga, the capital of Outer Mongolia. The engines are to be delivered by the British firm, Messrs. Reader & Co., while the boilers are to be supplied by Messrs. Babcock & Wilcox, of the United States, and the electrical equipment by the General Electric Co., of the United States.

Kendal.—Electricity Committee:—
Wigan Coal & Iron Co.—Twelve months' supply of not more than 150 tons of best Arley nuts, at 23s. 6d. and 24s. 6d. per ton according to the place of delivery; the rest to be John washed nuts, at 22s. 7d. and 23s. 7d. per ton.

London.—Fulham.—The B.C. is recommended to accept the offer of Messrs. Cory Bros., to supply 2,500 tons of small Welsh Dyllas coal, at 26s. 9d. per ton for the Electricity Department.

Manchester.—The following tenders for stores, &c., required by the Electricity Committee during the ensuing 12 months, have been accepted:—
Asbestos sheeting.—Bell's United Asbestos Co., Ltd.
Rubber insulated cables.—W. T. Glover & Co., Ltd.
Paper insulated cables.—Western Electric Co., Ltd.
Earthenware bridges.—Doulton & Co., Ltd.
Electrical accessories.—General Electric Co., Ltd.
Incandescent and radiator lamps.—British Thomson-Houston Co., Ltd.
Radiator lamps.—Dowsing Radiant Heat Co., Ltd.
Cable protectors.—Doulton & Co., Ltd.
Tape.—L. Andrew & Co., Ltd.
Paper sleeves tape.—W. T. Glover & Co., Ltd.
Bitumen tape and linen tape.—W. T. Henley's Telegraph Works, Co., Ltd.
Rubber strip.—C. Macintosh & Co., Ltd.
Service boxes.—Hardy & Padmore, Ltd.
Transformers.—British Electric Transformer Co., Ltd.
Trifurcating boxes.—W. Lucy & Co., Ltd.; British Insulated & Helsby Cables, Ltd.
Rubber-covered wire.—Liverpool Electric Cable Co., Ltd.
Flexible cables.—C. Macintosh & Co., Ltd.
Copper binding wire and fuse wire.—A. F. Goodwin & Co., Ltd.
Tin fuse wire.—British Insulated & Helsby Cables, Ltd.
Tubing and accessories.—Brotherton Tubes & Conduit, Ltd.
Recorder paper.—Elco Recording Press.
Stoker links.—Babcock & Wilcox (three months only).
Hellesen cells.—A. H. Hunt.
Varnish.—Pinchin, Johnson & Co.
Nickel-chrome wire and strip.—H. Wiggins & Co., Ltd.
Armature wire.—W. N. Brunton & Son.
Enamelled wire.—Connolly Bros., Ltd.
Box compound and bettite tape.—Callender's Cable & Construction Co., Ltd.
Boiler tubes.—British Mannesmann Co., Ltd.
Cable troughing.—Coalbrookdale Co., Ltd.
Léon jointing and packing.—J. Walker & Co., Ltd.
Air-cooled transformers.—British Electric Transformer Co., Ltd.
Cable.—British Insulated & Helsby Cables, Ltd.; C. Macintosh & Co., Ltd.
250-kw. and 500-kw. transformers.—Ferranti, Ltd.
Five 1,000-kw. transformers.—Ferranti, Ltd.
Coal unloading plant.—Hydraulic Engineering Co., Chester, with licence to sublet turntable to Dick, Kerr & Co., Ltd.
Valves.—J. Hopkinson & Co., Ltd.
Low-pressure circulating water pipes.—Aiton & Co., Ltd.

Oswestry.—For electrical installation at the new Arcade Theatre. W. H. Kay, Blackpool (accepted).

Salford.—The following tenders have been accepted by the Electricity Committee for the supply of materials during the period ending March 31st, next:—
J. Heaton.—2000 tons of Tyldesley slack.
Le Carbone.—Motor carbon brushes, £100.
Reason Manufacturing Co., Ltd.—Maximum demand indicators, £40.
L. Andrew & Co.—Cable accessories, £76.
Dussek Bitumen Co.—Joint box compound, £16.
North British Rubber Co.—Rubber overshoes and rubber caps for cables.
Baxendale & Co., Ltd.—Steam tubes and fittings.
Job Holland & Co.—Engine oil, £36.
J. Cookson, Ltd.—Waste, sponge cloths, &c., £90.

The offer of the British Westinghouse Co. to supply a 1,000-kw. rotary converter and transformer, has also been accepted.

The Tramways Committee has accepted the tender of Messrs. J. Russell and Sons, Ltd., for 40 tramway poles, at £12 17s. 2d. per pole.

Wolverhampton.—Electricity Committee:—
H. Morris, Ltd.—Forty-ton travelling crane, £1,450.
J. E. Perry & Son.—Steel chimney at the electricity works, £540.

FORTHCOMING EVENTS.

North of England Institute of Mining and Mechanical Engineers.—Saturday, August 5th. At 2 p.m. At the Wood Memorial Hall, Newcastle-on-Tyne. Annual general meeting.

NOTES.

Electrolytic Iron.—In a paper read before the American Electrochemical Society, Mr. O. W. Storey states that electrolytic iron, when deposited by the usual methods, is brittle, due to the hydrogen present. In this form it can be easily broken into small pieces, and even ground into a powder. By heating the iron to a red heat the hydrogen is driven off, and the iron becomes ductile, the ductility increasing with the temperature of annealing.

Brittle electrolytic iron, as deposited, is highly soluble in acids, being much more readily soluble than zinc. Annealing the iron makes it become more resistant to acid attack than ordinary irons and steels. This property of the brittle iron has resulted in the suggestion that it can be used for the manufacture of hydrogen by acid attack, in place of zinc, and other forms of iron.

The brittleness of the iron and its purity make it an ideal material for melting in crucibles, the hydrogen content having the additional virtue of forming a reducing atmosphere. The brittleness also allows it to be readily broken into small pieces for introduction into the crucible.

The high purity of the iron makes it possible for it to be used in competition with Swedish iron, and at approximately the same cost. It may also be used for pharmaceutical purposes as a base for compounds, of which iron is a constituent. Here again its purity is of value.

The much-suggested use of electro-deposited iron for electromagnetic purposes appears to be becoming of commercial importance. While the magnetic qualities of electrolytic iron seem to be superior to those of the commercial silicon irons, its high electrical conductivity counteracts this favourable property.

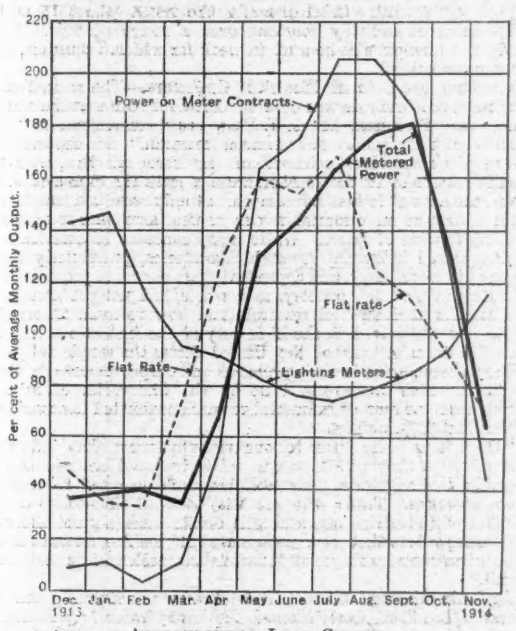
Electrolytic iron is used as a basis for scientific experimental work on the various properties of iron where the purest available iron is needed to secure the most accurate data. It is also used as a basis for "pure iron" alloys.

The materials that have been produced, and which seem to give the most promise for direct production without further mechanical working, are sheets and tubes. By producing these directly by deposition in such a manner as not to require further operations, it would be possible to make thin sheets and tubes of great uniformity. In tubes having thin walls, made by mechanical processes, these often vary in thickness, and it is hoped that this defect will be overcome by making them electrolytically.

The cost of producing electrolytic iron on a large scale, according to Mr. C. F. Burgess, the plant being of 1,000-KW. capacity, with an output of 8,640 tons per year of 360 days, would be about $10 per ton of refined iron. This is believed to be a liberal estimate. The operating costs, however, do not include interest on investment.

The cost of raw material is taken at $20 per ton, thus making the cost of the electrolytic iron approximately $30.

Electricity in Agriculture (Californian Data).—A recent issue of the *Journal of Electricity, Power and Gas* recorded some data regarding the agricultural use of power, supplied by the Mt. Whitney Power and Electric Co., California. This shows that of a total of 2,505 motors of 17,500 H.P., some 1,666 motors of 14,316 H.P. were used for agricultural purposes, and in view of the fact that the domestic use was largely on farms, and that the industrial use was mainly for packing and canning factories, over 90 per cent. of the load was directly connected with agriculture. A total area of 67,481 acres was irrigated by pumps. In 1914, 54 per cent. of the load was supplied under a flat rate of $50 per H.P. per year; 18 per cent. on a meter rent with a minimum of $24 per H.P.



AGRICULTURAL LOAD CURVES.

per year, and 14·5 per cent. on a meter rate with a minimum monthly charge of $1 per H.P. of installed capacity.

Farmers usually install as small a plant as possible for continuous operation, in order to reduce the bill, which depends on the maximum rate of use; the ratio of the average demand to the rated capacity of pumping motors is 94·3 per cent., and the average consumption per H.P. installed is 3,595 KW.-hrs. per year, representing a price of 1.39 cents per KW.-hr. to the farmer. It may be noted that in the cases of Citrus and Alfalfa, from four to six acres per H.P. were irrigated, and the average farm bill per year was $340 to $539.

The flat (or fixed) rate charge secures the company's revenue in bad years. There is an average of two consumers per mile of distribution line, which line costs the company $300 per consumer. Not more than one mile of extension is made to secure a 7½-H.P. motor, and this rule has resulted in a service density of 13 H.P. per mile of primary distribution line.

Thin-Plate Batteries for Reserve Service.—With the advent of large generators and boilers, the capacity of which can be greatly increased by forced draught, the necessity for battery discharge on the peak loads has diminished, so that now storage batteries are usually employed only for emergency reserve. At the present time the use of the long-lived and comparatively small-capacity batteries formerly employed has been discontinued, and a shorter-lived and higher-capacity type has been adopted by the New York Edison Co. The first experimental battery of this type was installed in the Thirty-ninth Street station in 1908.

It was decided to adopt 14/64 in. and 12/64 in. as the standard thicknesses for emergency-service positive plates and negative plates respectively. The capacity of the 14/64 in. positive plate, which is 15 in. wide and 31 in. long, is 150 amp. for one hour.

By adopting these plate thicknesses for central-station service a distinct gain is made in the amount of battery capacity that can be installed in a given space, since at the emergency rate of discharge, the capacity obtainable with a pasted-plate battery is as much as three times as great as from a Manchester-Box type battery occupying the same space. Another advantage accruing from the adoption of the pasted-plate battery is that interruption of electric service is made a more remote possibility.

The batteries installed on the New York Edison Co.'s system will carry the yearly peak load of the direct-current system for about seven minutes, which would ordinarily be long enough to correct any trouble which might happen to all the generating stations. As the yearly peak load exists for only a few hours, the ratio of battery capacity to load is much larger than stated during the greater part of the year.

The regulating or end-cell switches are located in a separate room immediately in front of the battery room, copper bars being run from the end cells to contacts on the switches. Four end-cell switches are provided with each battery, two for each side of the three-wire system, so that if one switch should fail to operate, the battery would not be disabled. The two switches on each polarity are normally operated in parallel.

A booster set is used in conjunction with each battery for charging purposes; each booster is connected in series with the station bus to produce a voltage high enough to charge the battery. Extending over all the cells is a special bus to which leads may be clamped for charging the individual cells. Whenever the battery is being charged, ventilating apparatus is employed to change all the air in the battery room once every ten minutes. The apparatus consists of a motor-driven exhaust fan and acid eliminator. The acid eliminator neutralises the acid fumes before discharging them into the atmosphere.

CAPACITY OF BATTERIES EMPLOYED BY NEW YORK EDISON CO. TO ENSURE RELIABLE SERVICE.

Total ampere-hours		373,800
Batteries in service at present	Waterside No. 1 and No. 2 ...	4
	Sub-stations	44
	Total	48
Total ampere rating of sub-station batteries for one hour		357,800
" " " " "	seven min.	1,311,200

The practice of holding all batteries in reserve for emergencies is universal throughout the system. With the exception of weekly charges and test discharges which are made at intervals of three months on each battery, all batteries float on the system continuously in readiness to take any load that may be thrown upon them. Incidentally, the batteries regulate the voltage and assist the balancer to furnish some of the unbalanced current in the three-wire system, especially at times of short-circuits on one side of the system. The weekly charging and test discharging are performed from 12 o'clock midnight to 8 a.m., when the load is lightest, or at a time when the battery to be charged or tested may be taken off the system without lessening the protection to the consumer.

The weekly charging of each battery is of about one hour's duration, and is for the purpose of determining the state of charge of the battery generally and giving the inspector opportunity for examining each cell for trouble, such as a low condition of charge due to internal or external short-circuits.—Philip Torchio, in the *Electrical World* (abstract).

Iron and Zinc in German Electrical Work.—A little light on the cost of the metals used in Germany in substitution for copper was recently shed by W. Weehinann in the course of a paper read before the Association of German Mechanical Engineers. As is well known, the electrical engineers in that country have had recourse to iron and zinc, owing to the comparative scarcity of copper for industrial purposes, and rules for the use of these metals were approved some time ago by the Union of Electrical Engineers, as previously mentioned in this journal. The author of the paper in question points out that in consequence of the greater cross section of the iron which is needed, the cost of an iron conductor is 20 per cent. greater than that of a copper conductor in order to obtain the same conductance for short distances, whilst in the case of long distances, where the cross section is so thick that the iron conductor has to be made in the form of a stranded cable, the difference in the price is much greater. This comparison relates not to existing conditions, but to the normal prices which prevail in peace periods. Special precautions have to be taken to prevent the rusting of the conductors, and soldering of the wire has strictly to be avoided, joints and branches being effected by means of clamps. In the case of zinc conductors, particular measures have had to be adopted in the rolling and drawing of the wires, the jointing of which has also to be carried out with clamps instead of with solder; but the wires cannot be used in exposed positions—that is, in the open air. As compared with prices in times of peace, the cost of zinc conductors is stated to be about equal to that of copper conductors of the same cross section. But as the conductivity of zinc is about 30 per cent. of that of copper, the zinc conductors are considerably dearer.

The question of electrical machinery was also discussed by the author, who remarked that zinc conductors could be utilised in machinery, especially in magnet coils. Motors which have a zinc winding, however, have an efficiency of only 60 to 70 per cent. of that of machines having copper coils, although it is claimed that the output of the latter can be reached by increasing the speed of the zinc coil machine by 10 per cent. Transformers have a yield from 50 to 60 per cent. of that of transformers provided with copper coils. From the rules laid down by the

Union it would appear that machines up to a fairly large size can be made with zinc windings. A further matter in connection with the comparative scarcity of copper is the fact that machines which were constructed some 15 or 20 years ago contained substantially more copper than those which were being built immediately before the war. The recognition of this circumstance has led to the idea of substituting new machines for old, with the object of recovering a large quantity of the copper. One large firm, for instance, is reported to have obtained 6 to 7 tons of copper in this way from the dismantling of 66 transformers which were constructed 15 years ago; and a large quantity of copper can also be derived from switchboard installations. Not only so, but the reorganisation of a complete installation is capable of yielding copper, as has been shown by the conversion of that at the Lehrte railway station from the two-wire 100-volt direct-current system to the three-wire three-phase system.

The problem whether the use of the present metal substitutes will be continued after the conclusion of the war has already been answered by the comparisons of cost previously given, which are wholly in favour of copper. At the same time, it is considered that iron and zinc will remain in use for high-pressure branch conductors which carry a light load, while the question whether zinc would offer advantages for the manufacture of cables for very high pressures has yet to be investigated, similarly to the inquiry which formerly led to the use of aluminium for this purpose.

Inquiry.—The electrical engineer of Fleetwood, Mr. W. H. Miller, would like to hear from other station engineers of a good serviceable lock for slot meters. The address of the maker of the "Tourtel" lock would also be useful.

Institution and Lecture Notes.—The Institution of Electrical Engineers.—A conference has taken place between the Electricity Supply Committee of the I.E.E. and the Joint Committee of the I.M.E.A. and the Incorporated Association of Electric Power Companies, with regard to co-operation between the Committees. These Committees are constituted as follows:—

I.E.E. Committee:

R. A. Chattock (Chairman), C. P. Sparks (President I.E.E.), C. H. Merz, S. L. Pearce, G. W. Partridge, T. Roles, W. B. Woodhouse,

Joint Committee of the I.M.E.A. and I.A.E.P.C.

I.M.E.A.	I.A.E.P.C.
J. H. Bowden.	W. A. Chamen (Chairman),
R. A. Chattock,	J. S. Highfield,
W. W. Lackie,	C. H. Merz,
S. L. Pearce,	D. A. Starr.
H. Faraday Proctor (*ex officio*),	A. D. Turckheim (*ex officio*),
T. Roles,	W. B. Woodhouse.

In order to avoid overlapping and to ensure co-operation and co-ordination, two members common to both Committees have been delegated as intermediaries, so that the two committees will be in continuous touch with each other's work.

It has been agreed that the I.E.E. Committee will devote its attention to the question of Electricity Supply from the point of view of the requirements of the country as a whole, and will deal with the engineering aspect of the matter, while the Joint Committee will go into more immediate questions of organisation and linking-up of existing undertakings, &c.

It will be seen from the above that the work of both Committees is of national importance.

Natal Engineers' Association.—Mr. John Roberts, the first chairman of the Engineering Section of the Natal Society for the Advancement of Science and Art, in his inaugural address dealt with "The Engineer in his Relation to Business," and referring to the saying that a man might be a good engineer, but was no business man, said that an engineer without "business" capacity was an engineer in name only, and could never achieve success. The business man was generally in control, and would claim that he was called upon to exercise powers of organisation; but that was the very first essential of the engineer—organisation was the indispensable factor to success in his work. The lay-out of the plant, the processes of manufacture, &c., all required organisation. The reason why the engineer occupied a position of inferiority was because he was the lineal descendant of the artisan, but he must struggle to secure control as well as responsibility.

Canadian Electrical Association.—The annual meeting of the Canadian Electrical Association was held on the steamship *Toronto* Canada Steamship Lines, on June 21st and 22nd, and was very well attended. The arrangement made permitted the Western members to take the boat to Toronto, and proceed thence to Prescott, where they were joined by representatives of the Eastern part of the country. In the absence of Col. D. R. Street, the president, who had just left on active service, the chair was taken by D. H. McDougall, vice-president, who was elected president for the ensuing year.—*Electrical World.*

Physical Society of London.—At the meeting held on June 30th, a paper, entitled "A Sensitive Magnetometer," by Dr. P. E. Shaw and Mr. C. Hayes, was read by the former. A torsion balance of extreme delicacy carries a pair of pure silver balls, each of 3 gm. weight. A solenoid with its horizontal axis passing through one of the silver balls is brought close to the balance. On exciting the solenoid, divergent fields of known strengths are obtained in the region of the ball. The resulting attraction of the ball to the solenoid is shown by a mirror reflecting a distant scale to a telescope. The couple on the torsion beam required to produce 1 mm. scale deflection is $4{\cdot}5 \times 10^{-7}$ dyne-cm., and this torsion balance is 10^6 times as sensitive as any known to have been used previously in this kind of work.

The magnetic properties of the silver have been ascertained even for weak fields of 1 — 10 gauss. The silver has a pronounced retentivity; this effect is presumably due to the small trace of iron impurity.

The relation of the susceptibility of silver to the field used has also been found. The susceptibility of each of the constituent materials (*a*) pure silver, (*b*) residual pure iron, appears to be greatly modified by the presence of the other material.

"Some Experiments on the Thermoelectric Properties of Fused Metals" were shown by Mr. Chas. R. Darling. The experiments related to observations made during the progress of a research, having for its object the production of a thermoelectric pyrometer with a liquid element. If such a pyrometer could be made of suitable materials—such as graphite and molten copper—it might be possible to extend the useful range of base-metal pyrometers up to or beyond the melting point of platinum, as the boiling point of copper is 2,310° C.

It was noted that when tin was partnered by iron, nickel, copper, constantan, or graphite, no abrupt change occurred at fusion, the E.M.F.-temperature curves showing no break.

On substituting lead, zinc, and bismuth in turn for tin, and using a variety of wires, it was again found that the change of state caused no alteration in thermoelectric properties. In the case of bismuth, however, three instances of thermoelectric "halt" were noticed, the E.M.F. attaining a maximum and then remaining unchanged over a considerable range of temperature. An iron-bismuth couple reaches a maximum of about 18 millivolts at about 250° C. (M. Pt. of Bi = 269), which remains constant to within 3 per cent. up to 550°, beyond which it has not been investigated. Copper and bismuth behave in the same manner, the E.M.F. being practically the same as in the former case; whilst aluminium and bismuth furnish a third example, the E.M.F. (about 15 millivolts) being remarkably constant over a range of 300°. This steady E.M.F. might also be used in work for which a constant, low E.M.F. was required.

American Institute of Electrical Engineers.—The annual convention of the Institute was held at Cleveland, Ohio, at the end of June. The President, Mr. J. J. Carty, read an address on "The Relation of Pure Science to Industrial Research." He showed that out of the stupendous upheaval of the European War, with its startling agencies of destruction, arose a growing appreciation of the importance of industrial research, not only as an aid to military defence, but as an essential factor in the development of every industry in time of peace. While many concerns in America had well-organised industrial research laboratories, particularly those engaged in metallurgy, and dependent upon chemical processes, the manufacturers of the country, as a whole, had not yet learned of the benefits of industrial research, and how to avail themselves of it. He considered it the high duty of the Institute to impress upon the manufacturers of the United States the wonderful possibilities of economies in their processes and improvements in their products, which were opened up by the discoveries of science, through the medium of industrial research conducted in accordance with scientific principles.

"Once it is made clear to our manufacturers that industrial research pays, they will be sure to call to their aid men of scientific training to investigate their technical problems, and to improve their processes. Those who are first to avail themselves of the benefits of industrial research will obtain such a great lead over their competitors that we are warranted in looking forward to the time when the advantages of industrial research will be recognised by all."

In distinguishing between industrial research and purely scientific research, President Carty likened the investigator in pure science to the explorer of new lands, and the investigator in industrial research to the pioneer who surveys the newly-discovered territory to locate its resources, and in other ways prepares for the peaceful and profitable occupation of the new territory.

"Industrial research supports itself or it fails of its purpose, and, therefore, it will not lack for generous encouragement and support. Scientific research, on the other hand, must have encouragement and financial support."

Mr. C. le Maistre, general secretary of the International Electrotechnical Commission, read a brief paper, in which he outlined the development of engineering standards in Great Britain, and showed how order and system are essential to modern production.—*Electrical World.*

We are informed that the Society of Engineers is experiencing considerable difficulty this year in arranging its usual visits to engineering works during the summer. Recently, however, Messrs. Johnson & Phillips were able to show the members a portion of their works at Charlton including a large plant for the manufacture of telephone cables capable of dealing with cables up to 1,000 pairs of small wires for local lines, and also trunk cables consisting of fewer, but heavier wires.

Enemy Firms Winding Up.—The issue of the *Board of Trade Journal* for August 3rd contains a consolidated list of enemy firms which have been ordered by the Board of Trade to be wound up. The list comprises the names of 279 firms, and is complete up to the Orders issued on July 31st. The date of the Order, and the name and address of the Controller appointed in each instance, are also included in the list, to which an alphabetical index is appended.

Patents and Alien Enemies.—The Board of Trade has granted licences to Messrs. Watson & Sons (Electromedical), Ltd., in respect of Patents Nos. 9499/12 and 13903/13, granted to Siemens and Halske A.-G.

Fatality.—The *Daily Chronicle* says that, through falling down a lift shaft at 22, Golden Square, London, an electrician named Galpin lost his life.

The Metric System.—At a meeting of the National Federation of Building Trades Employers at Brighton, last week, reported in the *Contract Journal*, the following resolution was proposed on behalf of the London Master Builders' Association :—"That this meeting considers that the present is an opportune time to revise our system of money, weights and measures, so as to bring them into harmony with the metrical system prevailing among the rest of the Allied nations, in order to facilitate trade relations between them and us after the war, and requests the Administrative Committee to make representations on behalf of the Federation to the Government accordingly, co-operating, if practicable, with other bodies which are moving in this direction." Several speakers urged that the adoption of the system would greatly tend to simplify quantities, and it was pointed out that the building trade had a system of measurements which was practically unknown in the schools of the country. The resolution was carried.

Educational Notes.—The South-Western Polytechnic (Manresa Road, Chelsea) will re-open on September 25th, for day and evening classes. The Engineering courses include lectures in electrical and mechanical engineering, physics, chemistry, and mathematics, and practical instruction in the laboratories. Students are prepared by recognised teachers of the University of London for the B.Sc. degree in Engineering, for the examinations at the engineering institutions, and those of the City and Guilds of London Institute. The evening courses also include classes in electrical wiring and other trade subjects. In the Electric Wiring Department an advanced course has been arranged for the preparation of candidates for the Final Wiremen's Examination of the City and Guilds of London Institute. Arrangements have been made for placing students who have passed satisfactorily through the three years' day course in positions with large engineering firms, and hitherto such firms have offered more vacancies than the Institute has been able to fill with its students. The prospectus may be obtained on application to the Secretary.

Northampton Polytechnic Institute.—Particulars of the Engineering day classes and courses in Technical Optics for the next session appear in our "Official Notices" to-day.

Parliamentary.—Electricity Supply Interconnection Schemes.—In the House of Commons, Mr. Healy asked the Secretary of the Board of Trade whether a circular had been issued by his department urging an arrangement to merge electrical supplies, with a view to saving coal; had he considered that new cables and other expense might be necessary to enable such plans to be carried out, involving capital expenditure; and would enabling legislation be introduced to render possible the desirable economies which the Board of Trade wished to effect in cases where statutory authority would be required? Mr. Harcourt replied that the answer to the first two questions was in the affirmative. In issuing the circular, the Board of Trade had not in mind any large schemes of interconnection involving heavy capital expenditure and a large use of material, but rather contemplated arrangements between undertakers whose areas of supply adjoined, or nearly so. He did not think that legislation for the purpose was necessary, but should the necessity for it appear to arise, he would give the matter full consideration.

Engineering Research on the North-East Coast.—The North-East Coast Institution of Engineers and Shipbuilders recently appointed a Research Committee, which has already made a start with its work by acceding to the request of a well-known firm in the North to carry out exhaustive tests of apparatus having for its object the more economical production of power by marine steam engines. The Institution claims to be the first of its kind actively to promote the progress of the industries with which its members are associated, by officially making and recording tests of new apparatus developed by them. Such work has been repeatedly called for of late, notably by the Council for Organising British Engineering Industry, and by the Scientific and Industrial Research Committee appointed by the Government, and we congratulate the North-East Coast Institution on its decision, which will certainly prove of great assistance in achieving the desired end.

Lifting-Magnets for Loading Pig-Iron.—In the *Electrical Review and Western Electrician* some particulars are given of the use of electromagnets for handling pig-iron on the American lakes. The freighter *Cleva*, the first ship to carry its own equipment of magnets, can load up with a cargo of 4,000,000 lb. of pig-iron, at a cost of £20, as compared with £100 to £120 for manual labour. Three 36-in. Cutler-Hammer circular magnets are provided, each controlled by one man, with one attendant for the generator. The three magnets, working simultaneously, lift 4,500 lb. of pig-iron.

Engineering Standards Committee.—At a special meeting of the Main Committee (Sir John Wolfe Barry, K.C.B., chairman), held on July 27th last, Mr. Charles le Maistre, A.M.Inst.C.E., M.Inst.E.E., who has been in charge of the work of the Electrical Section since 1903, was appointed secretary to the Committee in succession to the late Mr. Leslie S. Robertson. M.Inst.C.E., who was lost with Lord Kitchener in the disaster to H.M.S. *Hampshire* whilst on an important Government mission. We congratulate Mr. le Maistre on his appointment, which, we are sure, will be regarded with approval by all who are interested in the work of the Committee.

Volunteer Notes.—1st London Engineer Volunteers.—Headquarters, Chester House, Eccleston Place. Orders for August by Lieut.-Col. C. B. Clay, V.D., Commanding.

The Headquarters will be closed during August except on Tuesday evenings. The range will be open on Thursday evenings only. Instruction Classes at Regency Street will be held as usual for Platoons Nos. 9 and 10. The Camp at Otford will be available until August 31st. Members wishing to attend should enter their names at Headquarters.

Sunday Entrenching Parades. Parade in Uniform at Victoria Station (S.E. and C. Railway) Booking Office, 8.45 a.m.

Macleod Yearsley, *Adjutant.*

3rd Batt. (Old Boys') Central London Volunteer Regiment.—Battalion Orders by Capt. W. Ridd (Sub-Commandant), Thursday, August 3rd, 1916 :—

Week-End Parades.—Saturday.—The Battalion will Parade at Liverpool Street Station (Low-Level entrance, G.E.R.), at 8.40 a.m., for entrenching duties. Those who cannot take the early train will parade at 1.20 p.m.

Sunday.—The Battalion will Parade at Liverpool Street Station (Low-Level entrance, G.E.R.), at 9.30 a.m., for entrenching duties.

Musketry.—The Holland Cup Competition.—This competition was closed on Sunday, July 30th. The following is the result :—

1st Prize	G. S. Burge	...	93	T. R. Renfree	...	...	90
2nd ,,	S. T. Hanmer	...	92	A. G. Howell	...	...	88
	H. Locke ...	...	91	F. W. Vincent	...	...	88

Highest score possible—100 points.
Range—200 yards.
Target—Figure class marking.

There will be no shooting at Bisley on Saturday and Sunday next 5th and 6th inst.

Recruits will Parade at Lord's Cricket Ground on Saturday at 3 p.m., and on Sunday at 11 a.m., for recruit drill.

Wembley Park.—There will be no week-end parade at Wembley Park.

Clarence T. Coggin, *Acting Adjutant.*

Appointments Vacant.—A technical assistant is required for the sub-station of a large supply undertaking; fitter for power station in the West Riding; junior shift engineer for Erith; shift engineer for a West of England municipal works; charge engineer for the Llandilo U.D.C.; man for X-ray work and male nursing (£2) for the Royal Berkshire Hospital, Reading; station superintendent for Barking Town U.D.C. Electricity Department. See our advertisement pages to-day.

Manchester Corporation Tube Contracts.—The chairman of the Manchester Corporation Electricity Committee, on Wednesday, mentioned to the City Council an awkward dilemma in which the Committee are placed. Their minutes contained a recommendation that a tender for the supply of boiler tubes should be accepted from a certain firm. 99 per cent. of whose capital, the chairman said, was German. The difficulty was that the firm in question were the only manufacturers of these tubes, which were essential to the carrying on of the electricity department. The Committee, therefore, asked the Council to say what was to be done in the matter. The English works of the company were a controlled establishment under the Munitions of War Act. Alderman Kay, chairman of the Gas Committee, said the gas department were in exactly the same difficulty, all due to the lack of backbone of the Government in not taking the works over lock, stock and barrel. The Council, in the exceptional circumstances, suspended the Standing Orders, which would have prevented the acceptance of the tender, and agreed to accept it.—*Morning Post.*

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station and Tramway Officials.—Mr. S. H. Fowles, chief assistant electrical engineer to the Aylesbury U.D.C., has been appointed resident electrical engineer to the Leek Urban District Council, on the advice of Prof. Watkinson, of Liverpool University.

The Wimbledon Borough Council is recommended to make the following payments in respect of special services rendered in connection with the laying of mains and services and wiring installations, viz., to Mr. H. Tomlinson Lee, borough electrical engineer, £75; to the assistant electrical engineer, Mr. W. J. Oswald, £45; and £20 to Mr. B. A. Larney, clerk to the borough electrical engineer.

The Wolverhampton Corporation is recommended to grant increases in salaries to the following employés in the Electricity Department: Mr. E. Stubbs, chief assistant, from £225 to £250 a year; Mr. E. Forder, engine-room superintendent, and Mr. C. Bellhouse, boiler-house superintendent, both from £165 to £180; Mr. J. H. Rothwell, chief clerk, from £185 to £200.

The salary of Mr. F. Schofield, commercial manager to the Stalybridge, Hyde, Mossley and Dukinfield Joint Tramways and Electricity Board, is to be increased to £400 per annum, with two further annual increments of £25 to £450. Mr. Jagger, accountant to the Board, has resigned on receiving another appointment.

In answer to an inquiry from the Ministry of Munitions, asking whether Mr. J. W. Foster, permanent-way engineer to the Bradford Tramways Committee, could be spared to take up a post under the Ministry of Munitions, the Committee replied that it was essential that Mr. Foster should be retained in his present employment.

General.—The *Bulletin Militaire* states that Signor Marconi has been promoted from lieutenant to captain for exceptional services.—*Times.*

A young electrician, named Henry Howell, dived into the Thames between Westminster and Charing Cross on July 27th and rescued two drowning children.

Mr. George Verity, chairman of Verity s, Ltd., was married on Wednesday, at the Brompton Oratory, to Ada Hamilton Walter, of Hyde Park Gate, S.W. Congratulations!

Roll of Honour.—Lieutenant A. E. Head, of the Northumberland Fusiliers, who added to their fame in storming the German trenches on July 1st, has been "reported missing, believed killed." The deceased officer was 23 years of age. He served as a private in a Territorial battalion of the Northumberland Fusiliers, and subsequently was appointed to commissioned rank in a Tyneside Scottish battalion, in which he early got his second star for proficiency in scientific examinations relating to telephony, signalling and bombing, and at the front was given command of the Brigade Bombing school. He was the son of Mr. W. J. Head, manager of the India-Rubber and Gutta-Percha and Telegraph Works Co., at Newcastle.

The *Times* states that Lieutenant Thomas Challoner, R.E., who died of wounds on July 25th, a short time ago did most excellent work, for which he was awarded the Military Cross. He was a highly popular officer, and was well-known in Cardiff as an electrical engineer.

Signaller James Oliver, of the Manchester Regiment, an employé of Messrs. W. T. Glover and Co., Ltd., cable manufacturers, Trafford Park, has been killed in action, aged 28 years.

Captain R. C. Mather, of the Manchester "Pals," who is connected with the firm of Messrs. Mather and Platt, Ltd., has been wounded and is in hospital in London.

Private Harry Waldron, who has died of wounds, and Signaller Alexander Smith, killed in action, were serving in the Manchester "Pals," and prior to the war were both employed by Messrs. Baxendale and Co., Ltd.

Private J. Bradshaw, reported missing, was an employé at the British Westinghouse works, Trafford Park, as was also Private H. D. Strachan, reported wounded and missing.

Private F. Richards, of the Border Regiment, who was employed at the cable works of Messrs. Rickard, of Derby, has been missing since July 1st.

Private A. L. Castle, of the Birmingham City Battalion, Royal Warwickshire Regiment, who was engaged as an electrical engineer at Hetchford, fell in action on July 21st.

Signaller W. H. Harris, of the West Yorkshire Regiment, who was on the York Corporation Tramway staff, has been killed in the advance in France.

Lieutenant Walter Kell, late of the Barnsley Corporation Electricity Department, has been seriously wounded in France, and has lost a leg.

Sergeant Albert Hollins, of the Somerset Light Infantry, who was with Messrs. Siemens, of Stafford, has been killed in action. He was in the battle of Loos, gaining promotion there for gallantry.

Private W. Pemble, of the 8th Leicestershire Royal Engineers, an electrical engineer, has been wounded in action at Bezantine le Petit, and is in hospital at Liverpool.

Private Harry Lancaster, of the 6th Battalion, Northumberland Fusiliers, who has died of wounds received in action in France, was an electrician, aged 27. When war broke out he held an appointment at Gibraltar. He returned to England and joined his regiment over a year ago.

Private H. Robinson, of the Scots Guards, who has died of wounds received in action in France, was on the Preston Corporation tramway staff.

Rifleman Ernest Scotton, of the Rifle Brigade, who has fallen in action in France, was, prior to the war, engaged in the production department at the Rugby works of the British Thomson-Houston Co., Ltd.

Trumpeter F. W. Hymers, Royal Field Artillery, who has died from disease in India whilst on active service, was before the war engaged with Mr. Edmund Dunn, electrical engineer, of Broadstairs and Ramsgate.

Private Edward Comar, formerly employed at the British Westinghouse Works, Trafford Park, has been killed while serving with the Cheshire Regiment.

Private Harold Topham, formerly employed at the Middleton electricity works, has been killed in action.

Private Sydney Crawshaw, of the Royal Scots, killed in action, aged 20, was formerly employed on the clerical staff of the manager of the Oldham Corporation Tramways.

Lance-Corporal Robert Lyon, Royal Scots, who is wounded, was employed as an electrician in Edinburgh.

The *Times* records the death, on July 30th, at the age of 23, from wounds, of Second-Lieutenant Kenneth Richmond Cook, Black Watch, eldest son of Mr. David Cook, M.Inst.C.E., of Richmond and Westminster.

Corporal George Banks, of the King's Own Shropshire Light Infantry, who has been wounded in action, was employed at Darwen Electricity Works.

Private Charles Pape, of the Bradford "Pals," killed in the advance on July 1st, was an employé at the Bradford tramway headquarters.

Private W. C. Niness, of the King's Liverpool Regiment, wounded and now in hospital at Devonport, was employed before the war by Messrs. Drake and Gorham, at Manchester.

Sergeant John W. Adams, 2nd Border Regiment, employed by Messrs. F. Thornton and Co., electricians, of Burnley, has been recommended for the D.C.M.

Lance-Corporal H. Meech, of the King's Own Royal Lancaster Regiment, an employé of the Lancashire Dynamo and Motor Co., Trafford Park, has been wounded in France.

Sergeant Harry Branston, of the Manchester "Pals," formerly employed by Messrs. Baxendale and Co., Ltd., has been killed, along with his brother, Private W. Branston.

Captain Charles Skaipe Wolstenholme, of the Durham Light Infantry, who was killed on July 17th, was the assistant superintendent engineer at the Leeds Post Office Telephone Department. He was 43 years of age, and had had a long connection with the Territorial Force before the war.

A large number of our readers, particularly those in the London district, will learn, as we do, with very deep regret, that Company Sergeant-Major E. C. Laughton, who for nine years was associated with the Lamp and Fittings Department of Messrs. Siemens Bros. Dynamo Works, Ltd., has been killed in action. He joined H.M. Forces in September, 1914, and sailed for France early in May, 1915; he had therefore over 14 months' active service to his credit. Commencing as an ordinary Private, he gained promotion to Corporal before leaving for France, the remaining steps having been attained while on Foreign service. No details are available regarding the circumstances of his death, official notification of which was made last week, although the records show that he was mortally wounded in the very early stages of the Great Offensive. He was serving with the 8th East Surrey Regiment, which, according to newspaper reports, suffered heavily in the attack on the Fricourt section of the line. He was intimately known to many members of the electrical industry, who will deplore the loss of a valued friend and colleague.

NEW COMPANIES REGISTERED.

Phillips' Magnetos, Ltd. (144,456).—This company was registered on July 26th, with a capital of £1,250 in £1 shares, to adopt an agreement, dated June 24th, 1916, with I. Phillips, for the purchase of the business of a manufacturer of magnetos and all parts thereof carried on by him at Birchett Road, Aldershot. The subscribers (with one share each) are: I. Phillips, Falmouth House, Aldershot, cycle manufacturer; C. Melton, 30, Queen's Road, Aldershot, accountant. Private company. Table "A" mainly applies. Solicitor: N. Clinton, Aldershot. Secretary (pro tem.): C. Melton, Registered office: 10, Birchett Road, Aldershot.

New Peto and Radford Accumulator Co., Ltd. (144,436).—This company was registered on July 24th, with a capital of £30,000 in £1 shares (12,500 10 per cent. preference), to carry on in the United Kingdom and elsewhere the business of electricians, accumulator manufacturers, founders, manufacturers of mining, agricultural and other machinery, electrical and water supply engineers, manufacturers of and dealers in electric meters and other electrical instruments, etc., and to adopt three agreements, the parties to which are not named. The subscribers (with one share each) are: W. Peto, 12, Heddon Street, W., electrical engineer; C. R. N. Minchin, 149 Banbury Road, Oxford, engineer. Private company. The number of directors is not to be less than two or more than seven; the subscribers are to appoint the first. Remuneration (except managing director or other salaried official), £105 each per annum. Solicitors: Mayo, Elder and Co., 10, Drapers Gardens, E.C.

Carbic Italiano, Ltd. (144,400).—This company was registered on July 28th, with a capital of £30,000 in £1 shares, to take over from Carbic, Ltd., the business which that company carries on or is authorised to carry on in Italy and in Italian Colonies, together with the Italian patents and trademarks connected therewith, to adopt an agreement with the said company and H. Fonseca, and to carry on in Italy, its colonies or elsewhere the business of manufacturers and producers of and dealers in acetylene, carbide of calcium, and oxide of calcium, and chemical and electro-chemical productions of all kinds, mechanical, electrical and general engineers, electricians, metallurgists, motor manufacturers, suppliers of light, heat and power, manufacturers of and dealers in accumulators, generators, installations, lamps, apparatus, appliances and fittings, etc. The subscribers (with one share each) are: H. Fonseca, Geneva, engineer; A. Jackson, 51, Holborn Viaduct, E.C., secretary. Private company. The number of directors is not to be less than two or more than five; the first are H. Fonseca and another to be nominated and appointed by Carbic, Ltd. The said company has the right, while a member of the company, to nominate and appoint a director. Solicitors: Bristows, Cooke and Carpmael, 1, Copthall Buildings, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Troup, Curtis and Co., Ltd.—Particulars of £3,000 debentures, created July 5th, 1916, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Vaughan Engineering Works, Ltd.—A mortgage dated July 19th, 1916, to secure £1,600 and £500 as compounded interest, charged on moneys to be received under a War Office contract, has been registered. Holder: J. Gee, Carlton House, Regent Street, W.

Highfield Co., Ltd.—Particulars of £750 second debentures, created June 27th, 1916, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

A debenture dated July 19th, 1916, to secure not more than £500, charged on the above-mentioned property, has also been registered. Holder: J. H. Bland, 25, Stirling Road, Edgbaston, Birmingham.

A memorandum of satisfaction in full on July 19th, 1916, of a debenture dated December 4th, 1914, securing £300, has also been notified.

Parsons and Hodges, Ltd.—Particulars of £600 debentures, created June 30th, 1916, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled and unpaid capital. No trustees.

Rushmore Lamps, Ltd.—A memorandum of satisfaction in full on June 27th, 1916, of a charge dated May 27th, 1914, securing £2,000 has been filed.

Elliott Brothers (London), Ltd.—Particulars of £30,000 debentures, created June 28th, 1916, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

CITY NOTES.

German Electrical Companies.

The Nitrit Fabrik, A.G., of Kopenick reports net profits of £8,800 for 1915, as compared with a loss of £7,000 in the previous year. It is proposed to pay a dividend of 4 per cent. on the share capital of £75,000.

The C. Lorenz A.G. of Berlin (*telephone and telegraph works*) has just issued new capital amounting to £75,000, and thus increased the ordinary shares to £225,000. The additional capital is destined for the development of the undertaking.

The Fabrik fur Isolierter Drahte A.G. (*Vogel Telegraph Works*), which recently declared a dividend of 15 per cent. for 1915, has now secured the sanction of the shareholders to an increase in the share capital to £262,000 by the issue of new shares for £87,000, which have been taken over by a banking syndicate at the price of 130 per cent., and are to be offered at 138 per cent. The new capital is intended for the extension of the works, and particularly for the establishment of a lead-covered cable factory.

The Continentale Gesellschaft fur Elektrische Unternehmungen, of Nuremburg, which is the financial trust of the Nuremburg Schuckert Co., and owns or is otherwise interested in tramways and lighting undertakings, states that the working results of its concerns did not experience any improvement in 1915, the tramways in particular having suffered from existing circumstances. As net profits the accounts indicate the sum of £44,000, as compared with £60,000 in 1914, and a dividend has been declared at the rate of 2½ per cent. on the preference capital of £1,556,000, as compared with 3½ per cent. and 6 per cent. in 1914 and 1913 respectively. The report states that no direct information is available concerning the company's French and Russian interests.

The report of the *Wolfram Lampen, A.G., of Augsburg*, which relates to the financial year ended with March 31st, 1916, states that it was possible to maintain working notwithstanding the scarcity of labour and of raw materials, and sufficient orders were on hand for the ensuing months within the existing possibilities of manufacturing. The accounts show net profits of £7,100, as compared with £800 in 1914-15, and the available surplus permits of the payment of the arrears on the preference shares, the ordinary capital again receiving no distribution. It is added that the Court of Appeal has not yet decided the patent action in relation to the manufacture of the tungsten drawn-wire filament.

Electric Supply Corporation, Ltd.

Mr. J. G. B. Stone, presiding at the annual meeting held last Friday, said that the increase in the number of lamp connections had much exceeded the average growth, the advance being from 214,715 to 254,700 during the year. About 75 per cent. of this was due to demands for power in Dumbarton, leaving to their other towns approximately their usual growth, which in these times was not unsatisfactory. The Hendon Co., in which they were the largest shareholders, had increased its dividend by 2 per cent., whilst the Dumbarton Tramways Co. again paid them a small dividend of 1½ per cent. Apart from the normal capital expenditure, which had been chiefly on mains, they had had to provide £5,185 for Dumbarton, mainly on account of the converter plant necessary in connection with bulk-supply arrangements. The war had increased the demand for power but reduced that for lighting, particularly street lighting. The latter was especially the case at Chelmsford, but under the terms of their contract with the town, and in view of a recent decision in the Appeal Court, they understood that they were entitled to recover the full amount of the contract, and that had been included in the accounts. The contract concluded last March, and they were now negotiating with the Town Council for a renewal on the basis of their making that body a considerable allowance in regard to the payment due for 1915, when the lighting was so very much restricted. They raised prices generally for the last half of the year, and this year a further increase had been made to meet the heavier costs. The net result in the revenue account was that Chelmsford, Exmouth, and Falmouth showed increased profits; Hitchin, St. Andrews and Totnes were practically the same as last year; while Dalkeith, Dollar, Dumbarton, Jedburgh and Melrose showed a decrease. At Dumbarton the decrease was nearly £700, due to the costs being exceptionally heavy during the transfer of the load from their plant to that of the Power Company, they having to use both. The change over was now completed, and they would therefore only have one set of costs in future. The coal market was a very difficult one, and the effect of the Coal Prices Limitation Act left much to be desired. At Dumbarton, though they had a bulk supply, the price paid by them varied according to the price of coal. The new Summer Time was making serious inroads into their revenue this summer, but they were not yet in a position to say to what extent the yearly revenue might suffer. They proposed to pay 2 per cent. dividend, as against 2¼ per cent. last year, their policy being to let the year's dividend bear part of the reduction in profit, and their carry-forward bear the balance. The Chairman referred to the excellent services rendered by the staff under war conditions.

STOCKS AND SHARES.

Tuesday Evening.

This week two years ago was the first of the long series through which the Stock Exchange remained closed. Its doors were shut by the Committee that governs the House, not by the Government. The Committee's action was undoubtedly influenced by an appeal from the late Lord Rothschild urging this course. Since those far-off days new history has been woven in a thousand directions. So far as this particular column is concerned, the Stock Exchange has emerged from a precarious position on the slopes of panic-stricken bankruptcy to a condition of safety and stability by comparison with what might well have been expected as the result of European war upon a scale so unique.

Electric-lighting shares and Home Railway stocks are still for the most part standing at prices lower than those prevailing upon the outbreak of war. The electric-lighting industry has suffered blow after blow during the war. Home Railway stocks have come down because of the influences undermining all securities that lean upon the money market. But Underground Electric Railway Income Bonds are two or three points higher. Telegraph issues are better on the whole, though Indo-Europeans form an exception. The Eastern group stands substantially better. Marconis also have risen. Mexican descriptions are very much lower, and so are the British Columbia Electric Railway stocks.

During the past week the markets have taken on a summer-like condition that all the excellent news from the various fronts has failed to energise. Probably the weather plays some part in the listlessness; it is hard to arouse enthusiasm over investments what time the thermometer stands 13 points above Consols—taking the reading of both in the shade. Liveliness characterises the Shipping market, a full-dress gamble having sprung up in certain favoured shares. All shipping stocks are strong, however, and the speculation might well receive a little friendly attention from the Treasury.

Several more interim dividends are announced by the supply companies. The Metropolitan repeats its previous performance of 2 per cent., and the Chelsea declares 3 per cent. against 4 per cent. a year ago. Both the City of London and the County of London, it may be recalled, pay the same rates of 6 per cent. and 5 per cent. respectively, as they did this time last year. County ordinary continue to improve, and have gained another 2s. 6d. London Electrics also are firmer, a rise of 1/16 making them 1⅛. St. James' and Pall Mall are ex their dividend.

Electric Constructions put on their regular threepence per week. Edison and Swan drooped to 9s., but recovered to their former price of 9s. 6d. British Westinghouse preference have receded 1s. to 50s. 6d.

The Home Railway market is disposed to droop. Most of the Steam stocks are lower, and their example has been followed by those of the Undergrounds. Metropolitans are a point down. Districts lost ¼, and the Underground Electric group is a shade easier, except as regards the shilling shares. For this dulness there is no further reason than that afforded by the decline in the price of Consols, which is having its effect upon all stocks and shares influenced largely by considerations of the money market.

The interim dividends are out, and can fairly be regarded as satisfactory in every case. They matched anticipation too closely, however, for them to bring about, by themselves, any particular improvement; and, with nobody anxious to deal, quotations have sagged in sympathy with Consols. Even the revival of the Channel Tunnel scheme has failed to save Southern passenger stocks from pursuing the same track as the rest.

Brazil Tractions are again better at 62¼, the fraction marking the extent of the rise on the week. The Rio exchange keeps steadily above 1s. per milreis. Argentines, on the other hand, are slightly easier; and Anglo-Argentine Tramways second preference shares have lost another 2s. 6d., the price

being lowered to 3. As the interim dividend was postponed in respect of the last half-year, we have taken out temporarily from our columns the yield on the shares.

British Columbia Railway stocks are a little better, following upon the advance of last week; but most of the issues connected with Mexico have a very dull appearance, and the 5 per cent. bonds of the Mexico Trams and the Mexican Light and Power Companies are both lower at 40. New York being in the midst of a heat wave apparently more severe than our own, the Wall Street operators have ceased to take any interest in this group, with the result that some of the shares in the Latin-Canadian electricity companies have gently sagged in price.

The telegraph list is a little irregular. Cuba Submarines are 15s. up, thanks to a small demand, but otherwise what changes have occurred are mostly in the downward direction. The Eastern group has gone back a trifle. Great Northerns are 10s. lower, Westerns lost ½, and West India and Panamas 1/16, while Anglo-American stocks keep steady. Marconis at 3¼ are easier, but Marconi Marines have risen to 2¼ on the Board of Trade order that all ships over 3,000 tons shall be fitted with wireless apparatus. Americans are firm at 18s., and Canadians at 11s. British Insulated Wires at 12 are 5s. higher, repeating their rise of last week. Henleys gained 10s. at 16, but India-Rubbers, on the other hand, reacted to 12. Callenders preference at 4¼ are a little easier.

The Rubber market continues quiet, with business unexciting. Another drop in rubber took the price to 2s. 2d. per lb., which is not conducive to immediate bullishness. The shares in the group of chemical companies keep exceedingly firm, and there has been a fair rally in some of the copper issues, thanks to another substantial recovery in the price of the metal.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1914.	Dividend 1915.	Price Aug. 1, 1916.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	10	10	6⅝	—	£7 18 2
Charing Cross Ordinary	5	5	8⅝	—	6 18 0
do. do. do. 4½ Pref.	4½	4½	8½	—	6 8 7
Chelsea	5	4	8	—	6 13 4
City of London	9	8	12½	—	6 8 0
do. do. 6 per cent. Pref.	6	6	10¼	—	5 14 3
County of London	7	7	10 7/8	+ ⅛	6 8 9
do. 6 per cent. Pref.	6	6	10⅝	—	5 14 3
Kensington Ordinary	9	7	5½	—	6 16 7
London Electric	4	3	1⅝	+ 1/16	6 10 5
do. do. 6 per cent. Pref.	6	6	4½	—	6 13 4
Metropolitan	8½	8	9⅜	—	6 6 4
do. 4½ per cent. Pref.	4½	4½	8	—	7 10 0
St. James' and Pall Mall	10	8	5⅜xd	—	6 19 4
South London	5	5	2⅞	—	8 13 10
South Metropolitan Pref.	7	7	1½	—	6 4 5
Westminster Ordinary	9	7	6½	—	5 14 3
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	104	—	5 15 5
do. Def.	30/-	33/6	23	—	7 10 9
Chile Telephone	8	8	6⅜xd	—	5 18 5
Cuba Sub. Ord.	5	5	8½	+ ⅜	6 1 3
Eastern Extension	7	8	1 7/8	—	*5 7 8
Eastern Tel. Ord.	7	8	148½	— ½	*5 7 9
Globe Tel. and T. Ord.	6	7	12¼	—	*5 8 8
do. Pref.	6	6	10¼	—	5 10 4
Great Northern Tel.	22	22	87½	— ½	5 17 4
Indo-European	13	13	48	—	6 12 8
Marconi	10	10	3⅛	— 3/16	3 4 0
New York Tel. 4½	4½	4½	99⅜	—	4 10 3
Oriental Telephone Ord.	10	10	2 1/16	+ 1/16	5 0 0
United R. Plate Tel.	8	8	6⅞	—	*5 18 5
West India and Pan.	1	—	1 1/16	—	—
Western Telegraph	7	8	14⅛	— ⅛	*5 7 8
Home Rails.					
Central London, Ord. Assented	4	4	74	—	5 8 1
Metropolitan	1½	1	25½	—1	3 18 6
do. District	Nil	Nil	19	— ¼	Nil
Underground Electric Ordinary	Nil	Nil	13 3/16	— 1/16	Nil
do. do. "A"	Nil	Nil	6/6	+3d.	Nil
do. do. Income	6	6	90½	— ½	*6 12 10
Foreign Trams, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	5	—	6 0 0
Anglo-Arg. Trams, First Pref.	5½	5½	9¼	—	7 2 0
do. 2nd Pref.	5½	5½	8	— ⅛	—
do. 5 Deb.	5	5	77½	—	6 9 0
Brazil Tractions	4	4	62½	+ ½	6 8 0
Bombay Electric Pref.	6	6	10⅝xd	—	5 14 3
British Columbia Elec. Rly. Pfce.	5	5	60	—	8 6 8
do. do. Preferred	—	Nil	42	+ ½	Nil
do. do. Deferred	—	Nil	41	+1	Nil
do. do. Deb.	4½	4½	65	—	6 10 9
Mexico Trams 5 per cent. Bonds	—	Nil	40	—1	Nil
do. 6 per cent. Bonds	—	Nil	31	—	Nil
Mexican Light Common	Nil	Nil	20	—	Nil
do. Pref.	Nil	Nil	33	—	Nil
do. 1st Bonds	Nil	Nil	40	—2	—
Manufacturing Companies.					
Babcock & Wilcox	14	15	3	—	5 0 0
British Aluminium Ord.	5	7	26/-	—	5 7 8
British Insulated Ord.	15	17½	12	+ ½	7 5 10
British Westinghouse Pref.	7½	7½	50/6	—1/-	5 18 0
Callenders	15	20	12½	—	8 0 0
do. 5 Pref.	5	5	4¼	— ¼	5 17 8
Castner-Kellner	20	—	8½	—	5 6 8
Edison & Swan, £3 paid	Nil	—	9/6	—	Nil
do. do. fully paid	Nil	—	1½	—	Nil
do. do. 5 per cent. Deb.	5	5	57	—	8 15 8
Electric Construction	6	7½	16/9	+3d.	8 19 2
Gen. Elec. Pref.	6	6	9⅞	—⅛	6 1 6
Henley	20	25	16	—	8 1 3
do. 4½ Pref.	4½	4½	4	—	5 13 6
India-Rubber	10	10	12	—½	*3 6 8
Telegraph Con.	20	20	99	—	*3 4 0

* Dividends paid free of income-tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, August 2nd.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/8	..
a Ammoniac Sal	per ton	£75	..
a Ammonia, Muriate (large crystal)	,,	£54	..
a Bisulphide of Carbon	,,	£23	
a Borax	,,	£34	£1 inc.
a Copper Sulphate	,,	£51	..
a Potash, Chlorate	per lb.	2/6	..
a ,, Perchlorate	,,	2/-	..
a Shellac	per cwt.	98/-	..
a Sulphate of Magnesia	per ton	£18	..
a Sulphur, Sublimed Flowers	,,	£15	..
a ,, Lump	,,	£13 10	£1 inc.
a Soda, Chlorate	per lb.	1/1	3½d. dec.
a ,, Crystals	per ton	120/-	..
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
c Brass (rolled metal 2" to 12" basis)	per lb.	1/2¾ to 1/3	..
c ,, Tubes (solid drawn)	,,	1/2¾ to 1/3	..
c ,, Wire, basis	,,	1/3 to 1/3½	..
c Copper Tubes (solid drawn)	,,	1/5¾ to 1/6½	..
g ,, Bars (best selected)	per ton	£146	..
g ,, Sheet	,,	£146	..
g ,, Rod	,,	£146	..
d ,, (Electrolytic) Bars	,,	£135	£2 inc.
d ,, ,, Sheets	,,	£143	£1 inc.
d ,, ,, Rods	,,	£132	£1 inc.
d ,, ,, H.C. Wire	per lb.	1/3¼	¼d. inc.
f Ebonite Rod	,,	3/-	..
f ,, Sheet	,,	2/6	..
n German Silver Wire	,,	2/3	..
h Gutta-percha, fine	,,	6/10	..
h India-rubber, Para fine	,,	2/10	1d. dec.
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
l ,, Wire, galv. No. 8, P.O. qual.	,,	£36	..
g Lead, English Pig	,,	£29 10	5/- inc.
g Mercury	per bot.	£17 15	..
e Mica (in original cases) small	per lb.	6d. to 3/-	..
e ,, ,, ,, medium	,,	3/6 to 6/-	..
e ,, ,, ,, large	,,	7/6 to 14/- & up.	..
d Silicium Bronze Wire	per lb.	1/3½	..
r Steel, Magnet, in bars	per ton	£35	..
g Tin, Block (English)	,,	£171	£1 to £5 inc.
n ,, Wire, Nos. 1 to 16	per lb.	2/10	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

Charing Cross, West End and City Electricity Supply Co., Ltd.—Interim dividend on the ordinary shares of the West End undertakings for the half-year ended June 30th, 1916, at the rate of 4 per cent. per annum. This is the same rate as a year ago.

Blackpool and Fleetwood Tramroad Co.—Interim dividend at the rate of 4 per cent. per annum (4s. per share), free of income tax, on the ordinary shares for the past half-year.

City of London Electric Lighting Co., Ltd.—Interim dividend at the rate of 6 per cent. per annum (6s. per share), less income tax, on the ordinary shares for the past half-year. This is the same rate as a year ago.

Bristol Tramways and Carriage Co., Ltd.—Interim dividend at the rate of 5 per cent. per annum on the ordinary shares for the half-year ended June 30th, 1916. For the corresponding period last year the rate was 4 per cent.

Cordoba Light, Power and Traction Co., Ltd.—According to the *Financial Times*, the payment of the dividend on the preference shares will be postponed for the present.

Westminster Electric Supply Corporation, Ltd.—Interim dividend at the rate of 5 per cent. per annum, less income tax, for the half-year to June 30th.

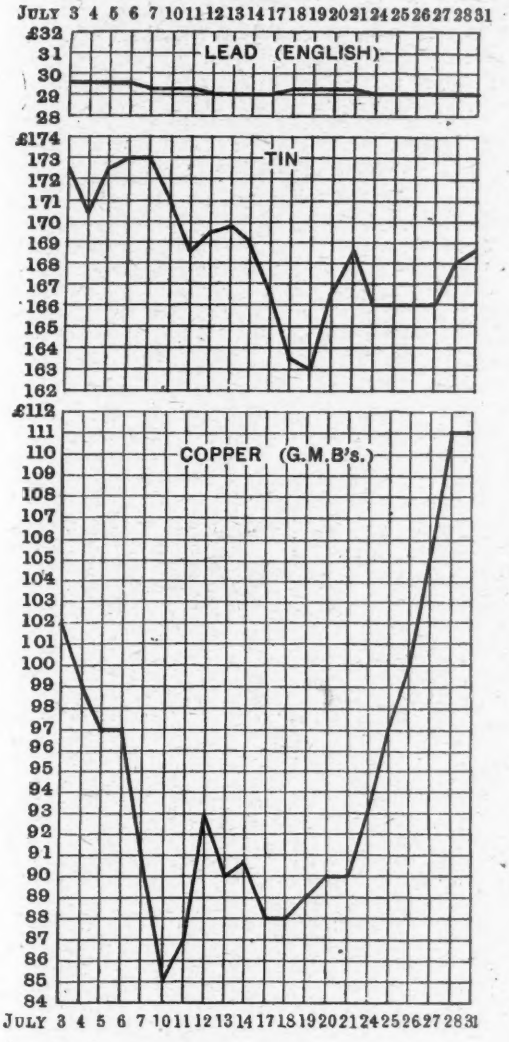
Chelsea Electricity Supply Co., Ltd.—Interim dividend at the rate of 3 per cent. per annum, less tax, on the ordinary shares, as compared with 4 per cent. declared at this time last year.

National Boiler and General Insurance Co., Ltd.—Interim dividend of 12s. per share, less tax, payable September 1st.

Vickers, Ltd.—Interim dividend 1s. per share, free of income tax, on the ordinary shares.

METAL MARKET.

Fluctuations in July.



S.A. Institute of Electrical Engineers.—In his valedictory address as retiring President, Mr. Bernard Price said that the most ambitious undertaking upon which the Institute had yet embarked was an investigation of the possible development by electrical means of the natural resources of the country. Consideration of the establishment of new industries had recently received an added stimulus: the war and its effects upon the importation of manufactured articles and commodities to the country had naturally directed attention to increased utilisation of local resources, and the Government had appointed an influential Committee to consider the whole matter. The formation of the Government Munitions and Industries Committee had therefore provided the necessary machinery for the assimilation and utilisation of the data and information that had been worked up by the Institute's Committee, and it was hoped that the report on electrochemical industries, which had just been completed and which was already in the hands of the Government Committee, would be the means of accelerating the establishment of such industries in the country. The present time was particularly opportune, and there was no time to be lost. If the British Empire and her Allies were to consolidate the victory which they would surely gain over their enemies, at terrible cost, it was imperative that they should organise industry on new lines. One most important factor in the problem was the education and training of engineers, because the efficiency of the industrial and commercial machine must ultimately depend to a very large extent upon the skill of those who controlled it. He was very optimistic as to the future prosperity of the Institute. Africa was a young country, possessing almost infinite possibilities, and electricity had to play an important part in the development of those possibilities. It must surely be only a matter of time before rapid strides would be made in the opening up of the vast resources now lying dormant.

PROSPECTS IN SOUTH AFRICA.

By R. TURNBULL MAWDESLEY.

Johannesburg, *June 23rd*, 1916.

The following brief article is prompted by the appearance in your columns (issue dated May 19th) of an inquiry from a correspondent of Dutch nationality regarding the present prospects in South Africa for electrical men. Your issue of May 19th has only just arrived, and I fear that any information I am able to tender can hardly reach you in time to be of any service to your correspondent. However, others may be interested in the prevailing conditions along the Reef, and in South Africa generally; and I am giving some general information with reference to the prospects for newcomers.

I ventured to remark in these columns as emphatically as possible, some three years ago—at the time of the great strike in Johannesburg—that on no account should electrical men come to South Africa on speculation, and since that period things have not changed.

It is to be feared that matters, from the point of view of employment, have got rather worse since the outbreak of the war. It should be said at once that, although a great many men connected with electrical affairs have gone to German East Africa with General Smuts, there are positively no appointments vacant in consequence. The reason for this is not far to seek. No construction work is at present going on—partly because of the difficulty in getting material from home, and for other reasons equally obvious. Even if the sanction of the Minister of Munitions is obtained to proceed with work other than munition work, it is not to say that, in consequence, Colonial orders can be filled with any degree of speed by the manufacturers. It will be appreciated, therefore, that where drawing and designing office staffs were depleted by men "joining up" no attempt has been made—nor has it been necessary—to fill up the openings thus caused. Again, apart from construction work, where maintenance and operating staffs have been depleted, it has always been possible to fill up such vacancies locally so far.

The branch offices of the big manufacturers are practically at a standstill through the stoppage of all construction work, and therefore new-coming engineers, whether they be trained commercially, technically, or practically, have little chance of securing what I may term a staff appointment. There are at present many certificated men of undoubted ability working, practically, on the mines at an artisan's wage; and this is not an alluring prospect for any one who knows what a Rand mine electrician, or fitter, is called upon to do.

In any notes upon electrical matters in South Africa, one is forced to keep the Rand in his mind's eye. This is unquestionably the area concerned, as, apart from Capetown, Durban, and one or two other comparatively small towns where the municipalities have electric supply undertakings, there is no electrical work at all, if we except the small "'dorps" which possess tiny suction-gas plants with a staff of, probably, two white men. South Africans are keen upon saying that there must be a complete abandonment of the foolish and singularly short-sighted attitude in which the Rand is regarded as a milch cow for the rest of South Africa; but that attitude cannot be abandoned from an electrical view-point.

If we consider the diamond mines at Kimberley, the gold mines on the Reef, and one or two outlying coal mines, we have all the industries at once where electricity is applied on any great scale.

There are no great factories in South Africa which take power in bulk, and it follows that the Rand is, to all intents and purposes, South Africa, when we speak of electrical matters.

Now the Victoria Falls and Transvaal Power Co. has a recognised system of promotion from the junior ranks, which is rigidly adhered to when any opening occurs at the top. This forms an undoubted encouragement to the juniors, though distinctly hard on a newcomer; and although a "new chum" might be fortunate enough to strike a billet, either with this great company, or elsewhere, it is to be regretted that his chances are distinctly small. There is

too, a School of Mines and Technology in Johannesburg, where students are well grounded, and where encouragement is given by the mining houses to Afrikanders to train technically and practically in the mining and engineering professions.

All resident engineers on mines must possess the Government certificate of proficiency before they can take absolute control. There are two classes of certificate, one for electrical, and one for mechanical engineers—though either is sufficient. The examination is somewhat similar to that for the Associate Membership of the I.E.E.; but when one has grown rusty, it offers some difficulties. An honorary certificate is given to engineers who have been in executive positions for a period of not less than three years.

The Johannesburg municipality has taken steps to prevent further members of its power-station staff from going either overseas, or to G.E.A., and, consequently, there is nothing doing in this direction—the present staff having grown comparatively old in its service.

Regarding the actual *practical* side of the question, it should be said that there are no electricians, fitters, or mechanics at present unemployed here. The mines offer a wide field for practical men, especially armature winders. The pay of a mine electrician varies from 18s. 4d. to 25s. per day, according to his experience, but the average is 20s. per day, with a 48-hour week,

These figures, when compared with British rates, are distinctly misleading. Notwithstanding the improvements in transportation and railways, Johannesburg, and the Witwatersrand generally, are still among the most expensive places in the world in which to live—and this quite apart from the more recent increase in the price of commodities owing to the war. It must be remembered that Johannesburg (the actual centre of the Reef) is roughly 1,000 miles from Capetown and 600 from Durban, and situated at the top of a mountain range, where it is tropically hot in the summer months (October to March) and bitingly cold in winter (April to September); so that, although £6 per week seems a high standard of pay, it is not worth more than 50s. per week in Great Britain—in fact, a man with 50s. per week at Home is in much the better position.

If, therefore, a man is practical, and satisfied with an electrician's job in the meantime, it might not be a bad "spec" to come to the Rand; but the cost of living is the chief item to be considered. Clothes are very expensive, 100s. to 200s. being the cost of a suit; boots are 20s. to 45s., and all food and raiment is on an equally high scale. Also house rents are abnormally high, the merest "cottage" being rented at £5 or £6 per month. Railway fares are the only cheap thing, and this is necessary owing to the long distances between towns in S.A. (the Rand excluded).

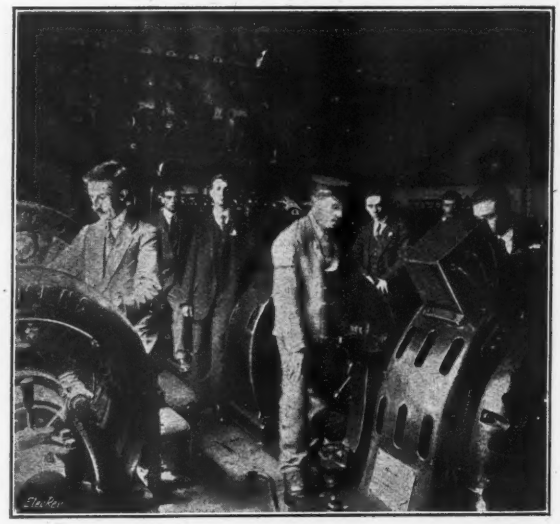
The Witwatersrand Reef, where all the big gold mines are situated, runs east and west about 50 miles, from Springs to Randfontein, with Johannesburg in the centre; and along this Reef are situated a number of towns of more or less importance. Of these, Johannesburg, Krugersdorp, and Randfontein (a suburb of Krugersdorp) each have their own municipal plant, but the remaining towns are supplied for lighting, &c., from the V.F.P. Co.

In conclusion, it is far from my intention to cast a wet blanket on the enthusiasm of any electrical man who intends coming here; but, in common fairness, it is desirable to say that neither general ability in languages nor profession can procure one employment of a suitable kind where none exists.

THE EMPLOYMENT OF DISABLED SAILORS AND SOLDIERS.

Early in the war, the fact that many men who had suffered permanent injury in the service of their country would return to civil life maimed and unfitted to resume their former avocations, and would need assistance to enable them to find new occupations, was appreciated by the Council of the Institution of Electrical Engineers, which accordingly invited employers in the electrical industries to take such cases into consideration (Elec. Rev., June 25th, 1915). At that time, however, it was found that there were very few candidates for employment, the demand for them apparently exceeding the supply.

Obviously, this happy state of things could not be expected to last, and, with a view to forestalling the future, a small Committee was formed of members of the Council, who took the matter in hand, and accumulated a guarantee fund to cover expenses (mainly out of their own pockets). The most obvious opening for partially-disabled men in electrical work was as switchboard and sub-station attendants; certain physical disabilities, such as the loss of an arm or a leg, or one eye, would not seriously diminish the efficiency of the men for these purposes, though such cases as loss of nerve through shock, &c., were evidently unsuitable. The necessity of at least a smattering of technical knowledge for the adequate fulfilment of the duties of such posts, however, presented a serious obstacle. The Committee therefore approached, in the first instance, the Education Committee of the London County Council, as the Education Authority for London, which suggested that the work should be undertaken by the Northampton Polytechnic Institute. The co-operation of Dr. R. Mullineux Walmsley, the Principal, was invited, and he undertook, with the assistance of the Committee, to prepare a scheme for putting the men through a short course of training at the Institute; at a meeting held at the Institution of Electrical Engineers, on



Soldiers in the Power House.

April 7th, at which Dr. Walmsley met the representatives of the Councils, it was decided that the work should be put in hand. In the first instance the classes were to be of an experimental order, and if successful results were attained, the scope of the operations was to be enlarged, and the system eventually extended to provincial centres. No fees were to be charged for the tuition, but, on the other hand, wages were not to be paid to the men during their course, the guarantee fund being intended to cover the cost of training only, and not to provide for maintenance.

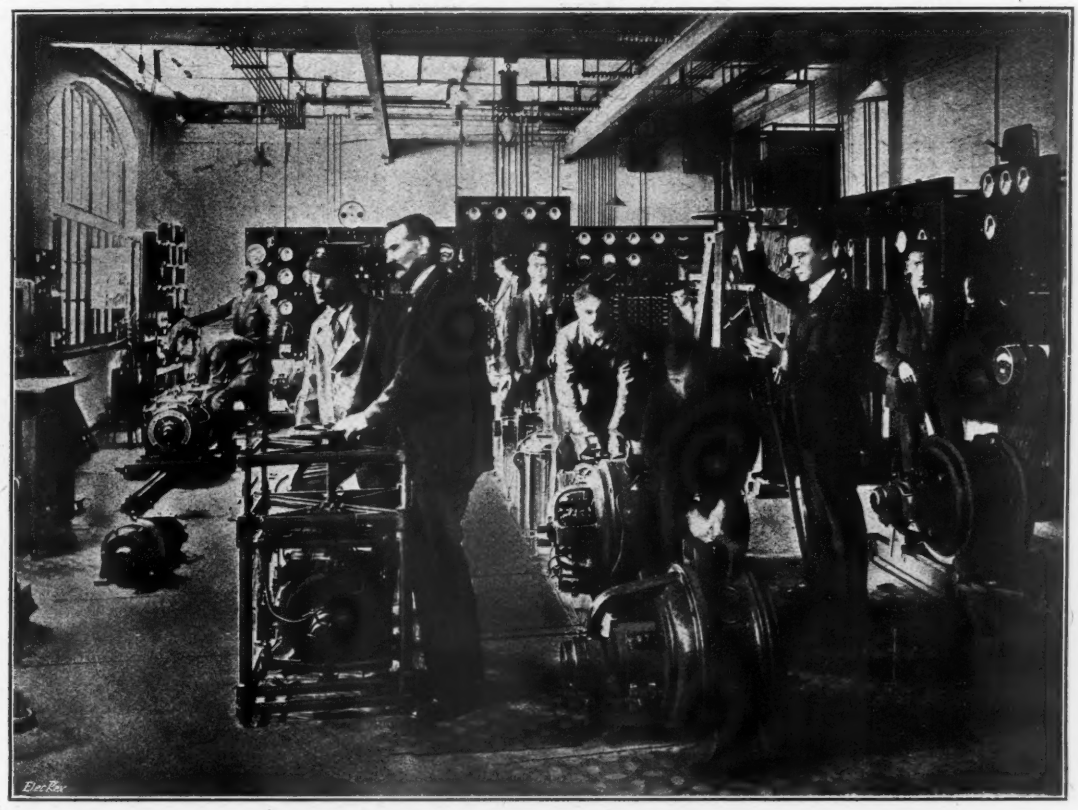
Mr. F. M. Denton, Associate Head of the Department of Electrical Engineering and Applied Physics at the Northampton Polytechnic Institute, was present with Dr. Walmsley, and the nature of the training to be given was outlined. At a meeting on April 27th the matter was further discussed, and it was agreed to proceed with the organisation of training classes.

Accordingly, Dr. Walmsley obtained introductions from Sir Alfred Keogh, K.C.B., Director-General of the Army Medical Service, to the officers in command of six military hospitals in the metropolitan area, and, with Mr. Denton, visited the hospitals with a view to obtaining pupils; but at this stage a remarkable series of difficulties arose, differing in character at each hospital, for some readily afforded facilities which others could not accord, and *vice versâ*. Hence it came about that though all was ready at the Institute in April, a start could not be made with the first contingent of men

until June 26th. One great difficulty, which might have been fatal to the scheme, was that of providing for the maintenance and travelling expenses of the men during their course of training; this was only overcome by the aid of the Disabled Soldiers' Aid Committee, of 40, Ebury Street, S.W., whose work has been beyond praise. The Committee undertook to defray the travelling expenses and the cost of dinners for those men whom it had been instrumental in sending to the classes. The first class numbered 14, of whom only 5 were derived from the hospitals, the D.S.A. Committee sending the rest. Accommodation was provided by the Institute for 20 men. The personal services of Mr. G. R. Buckley and Mr. R. Cunliffe are described by Dr. Walmsley as invaluable, and Mr. Buckley further encouraged the men by offering substantial prizes for competition to the first class, which closed in July, and to the second, which is now in training.

Perhaps the most serious difficulty met with in forming the classes was one to which we wish to draw particular attention, as to our mind it reflects the greatest discredit upon the Government department which is charged with the duty of allocating pensions to our disabled heroes—men whom it should be our pride and boast to protect from injustice and oppression, and to compensate with generosity, and by every means in our power, for the voluntary sacrifice which they had made for their Motherland. Far from adopting this view, it is the practice of the Government to hale each man before a Medical Board, which appraises the net value of his earning power, *and deducts it from his pension.* For example, it is reported that a man who had lost a limb, and was receiving a pension of 25s. a week, was held to be capable of earning about 15s. a week, and his pension was reduced to 10s. 6d. a week. Could anything be more monstrous than this iniquitous procedure, by which men are provided with direct incentives to malingering and idleness? The fact that a man, though partially crippled, is likely to be able to earn wages does not in the least affect his undoubted right to the fullest possible compensation for the injury suffered in the service of his country, and in this connection we may point out that a workman injured in the course of his employment is entitled to recover substantial compensation in a Court of Law. Surely a man who has voluntarily risked his life and lost a limb has a far higher claim for compensation than one who has merely met with an accident! Fortunately, this subject has been vigorously taken up in the daily Press, with the redoubtable assistance of Sir Frederick Milner (whose health unfortunately has broken down completely under the strain of his arduous labours), and we hope that public opinion will soon compel the Government to abandon the paltry policy of chaffering and cheeseparing with the nation's defenders.

The course is laid out for a period of four weeks' training, from 9 to 12 and 1 to 4 daily, five days a week, making a total of 120 hours. The first class, attended from June 26th to July 21st, numbered 14; three men failed to come up to the standard tentatively set up, but 11 were passed as eligible for employment. The men were found to be, as a rule, excellent learners, interested in the work and readily picking up the novel ideas that were put before them. More applications were received from supply authorities than could be filled; the County of London Co. asked for two and took four, who were not able to leave London, and inquiries were received from Edinburgh, Manchester, Newcastle (3), Nottingham, South Wales (4), Cleveland and Durham (3), and a private firm. The Institute recommends the men for a month's probation, with wages, on the jobs where they will be employed, and urges that the full normal rate of wages shall be paid to a man who performs the whole of the duties usually attached to his post.



Disabled Soldiers at work in the Laboratory of the Northampton Polytechnic Institute.

The second course started on July 17th with 20 men, and applications for men have been received from the L. & N. W. Ry. Co. and from Salford, Tynemouth, Liverpool, Leeds, Birmingham, Blackburn, Woking, &c. The Committee has decided that after the second course has been completed, the scheme shall be suspended for a month or two, to see how the first two squads of men get on in their jobs; a meeting will be held in September at which the whole position will be reviewed, and if the results are found satisfactory, arrangements will be made to resume the courses in October at the Northampton Institute, and, if possible, to start provincial courses.

The system of training to be adopted presented an entirely

new problem, as regards both the subjects and the objects of the training, but Mr. Denton has laid out a course of instruction, approved by the Committee, which appears to be admirably adapted to its purpose. The course includes a series of five or six lectures, or, rather, demonstrations, lasting about one-and-a-half hours each, on elementary facts regarding electro-technology. The men are required to make notes (quite the most difficult part of the system to them, but soon mastered) and are encouraged to ask questions, and after each lecture they write out their notes, whilst the instructor discusses and explains the various points to them individually. Practical laboratory work with simple apparatus follows, bearing as far as possible upon the future occupations of the men; for this purpose they are paired off in groups, with an eye to the desirability of associating a man who has a right arm with a mate who has a left—a consideration that touches one's heart, but which the men, fortunately, regard as a matter for jocularity.

Simple experiments on heat and thermometry are carried out, and the men make a buzzer, wind a model D.C. and A.C. armature, and make up an elementary transformer—all actually *working* models, most ingeniously contrived to exhibit with the least expenditure of labour and material the utilisation of the great fundamental principles.

To familiarise the pupils with electrical machinery, they are divided into groups of not more than four, each of which is provided with a demonstrator, and spends, say, an hour in examining a motor or switchboard, the demonstrator answering questions and explaining the use and purpose of each part of the apparatus. Actual workshop practice is also taught as far as possible in the time available, such operations as soldering, jointing wire and cable, vice work, and the use of simple hand-tools being dealt with. Elementary testing is included in the course. No better choice of a teaching institution could be made, for the Northampton Polytechnic Institute is specially equipped for training men in station work; we have described and illustrated the excellent modern plant installed in the electrical engineering department (Elec. Rev., October 21st, 1910, p. 665), which includes D.C. and A.C. generating and transforming plant, switchgear of the flat-board and cellular types, with remote-control and bench-control boards, &c., expressly laid out to represent current practice. Thus the pupils are enabled to handle apparatus of type similar to that which they will meet with later, and are taught something of the methods of synchronising and paralleling machines, regulating the voltage, &c. If the system of instruction that is under trial does not prove successful at this Institute, it is safe to say that it will not succeed anywhere.

Lastly, through the kindness of the County of London Electric Supply Co., the men are allowed to visit the company's City Road generating station and certain sub-stations; in this part of the work Mr. Dallas has rendered invaluable assistance by making the necessary arrangements. On the occasion of these visits the station staffs carry out various routine and special operations for the instruction of the men.

As a mark of the high esteem in which the work is held, we may mention that H.H. Princess Marie Louise, who is the president of the Disabled Soldiers' Aid Committee, is about to visit the Institute, to see the scheme in operation.

In conclusion, we wish to thank Mr. C. P. Sparks, chairman of the I.E.E. Committee, Dr. Walmsley, and Mr. Denton, for affording us facilities to describe the working of this excellent project. The energy and enthusiasm with which they have devoted themselves to perfecting the organisation and carrying it into practice, command our admiration, and, we hope, will compel success. We may add that one factor necessary to success, which is beyond the control of these gentlemen, is the central-station manager's goodwill; without this, the system could not be given a fair trial. But we are certain, and indeed the proofs are already forthcoming, that this factor will not be lacking; and we are sure that engineers and managers will afford the men thus partially trained every opportunity to acquire further knowledge and skill in carrying out their duties, even though at first their patience may be tried by the unavoidable inexperience of their new hands. For have not these men risked their lives on our behalf? "Greater love hath no man than this"—let us show them that we are indeed their friends.

THE CHOICE OF CONTINUOUS-CURRENT MOTOR-CONTROL APPARATUS.

By W. PERREN MAYCOCK, M.I.E.E.

When first investigated, there would appear to be a needless and somewhat bewildering variety of apparatus for the control of motors, but this impression is dispelled when we approach the subject from "outside," so to speak, and consider, *first*, what the motor has to do; and, *secondly*, what is the most desirable method of operating it.

If, starting on this plan, we take the simplest cases and lowest powers first, and proceed step by step to the more complicated cases, it will be found that the methods and apparatus sort themselves out into more or less definite groups.

The consideration of matters from this point of view could obviously be detailed at some length, particularly as regards the various tests to be undergone, and the details of construction and mounting; but we must certainly leave these unconsidered, and other omissions must be excused.

When any given *electric drive* is to be considered, the Motor comes first, the Method of Control next, and the Control Apparatus last. Thus the type of motor and method of control lead up to the choice of control apparatus, but cost often determines the method, and very frequently the actual make of apparatus also.

The points to be considered may be tabulated as follows:—

Motor.

Type (T)	(Tsh)	Shunt.
	(Tse)	Series.
	(Tc)	Compound.
Power (P)	(Pvl)	Very low (say up to 1 H.P.).
	(Pl)	Low (say up to 10 H.P.).
	(Pm)	Medium (say up to 100 H.P.).
	(Ph)	High (say above 100 H.P.).

Method of Control.

Motion (M)	(Ms)	Starting only (s).
	(Msr)	Starting (s) and speed regulating (r).
	(Msv)	Starting (s) and reversing (v).
	(Msrv)	Starting (s), speed-regulating (r), and reversing (v).
		Inching (i) can be combined with any of the above.
Operation (O)	Hand (h) (Oh)	By hand simply.
	Hand (h) (Ohd)	By hand, with one or more distant stop-buttons.
	Hand (h) (Ohs)	By hand, with slow-motion or slow-acting gear.
	Hand (h) (Ohsd)	By hand, with slow-motion or slow-acting gear, and with one or more stop-buttons.
	Semi-Automatic (sa). (Osab)	By pressing one or more buttons.
	Semi-Automatic (sa). (Osamc)	By operating a master-controller.
	Semi-Automatic (sa). (Osar)	By pulling a rope or chain.
	Automatic (a) (Oaf)	Float operation.
	Automatic (a) (Oal)	Lever operation.
	Automatic (a) (Oap)	Pressure operation.
Devices (D) for protection, &c.	(Df)	Fuses.
	(Dcb)	Circuit-breaker.
	(Dnv)	No-voltage release.
	(Dnvol)	No-voltage and overload release.
	(Db)	Braking.
	(Dss)	Speed-setting (for machine tools, &c.).

The above tabulation may be used in two ways, first, for indicating the whole requirements of a given motor application; and, secondly, for showing the character of a given control apparatus only.

As an example of the first use, let us suppose that the motor is to be series-wound, that it is of 50 H.P., that it is to be regulable as regards speed and reversible, that it is to be operated by a master controller, and that the control apparatus is to have a no-voltage and overload release.

These various requirements may then be summed up as:—

Tse, Pm, Msrv, Osamc, Dnvol.

This gives, in a very concise form, the main information in respect of type (T), power (P), motion (M), operation (O), and devices for protection, &c. (D).

In using the tabulation in the second way mentioned above, viz., for indicating the character of a given control, it is clearly not always necessary to give the T and P descriptions.

It is conceivable that some such tabulation would be useful in practice when all sorts of motor work have repeatedly to be dealt with.

Map of Russia.—Messrs. R. Martens & Co., Ltd., of 149, Leadenhall Street, E.C., shippers and mercantile engineers, who have branches in seven principal cities of Russia, have issued a large economic map of Russia which should prove useful to traders who are interested in the cultivation of closer trading relations between this country and Russia.

SOUTH AFRICAN MUNICIPAL ELECTRIC SUPPLY STATISTICS.

The following data relating to South African municipal electricity supply undertakings appeared in a recent issue of the *South African Mining Journal*:—

Town.	Generation.	Condensing.	Pressure of generation.	Pressure of distribution.	Alternating or direct current.	Mains.	Plant capacity.	Maximum load.	Units sold per annum.	Number of street lamps.	Number of consumers.
*a*Aliwal North ...	Water	—	480—510	230 & 460	D.C.	Under	—	65	60,000	80	250
Benoni	Bulk	—	3,000	200 & 346	A.C. 25	Both	450	350	—	259	924
Bloemfontein ...	Steam	Yes	2,000	347 & 200	A.C. 50	Both	1,700	458	1,430,000	471	1,400
Boksburg	Bulk	—	2,100	230	A.C.	Both	400	400	370,000	450	740
*c*Bulawayo	—	—	—	—	—	—	—	—	—	—	—
Cape Town	Steam	Yes	475 & 2,200	440 & 220	A.C. & D.C.	Both	2,625	1,984	5,031,716	1,675	2,772
Ceres	Water	—	110	110	D.C.	Over	35	30	4,200	100	75
*d*Dundee	Steam	No	220	210—200	D.C.	Both	100	60	—	47	200
Durban	Steam	Yes	6,600, 2,750 & 550	550, 100, & 200 A.C., 500 D.C.	A.C. & D.C.	Both	8,950	4,200	13,752,000	2,462	6,487
East London ...	Steam	Yes	2,200 & 550	110 & 550	A.C. 50 & D.C.	Both	950	1,000	1,355,627	546	1,475
*e*Germiston	Bulk	—	—	—	—	—	—	—	—	—	—
Greytown	Steam	No	220	200	D.C.	Over	136	55	48,000	72	143
Harrismith	Steam	No	2,100	200	A.C. 50	Under	185	70	102,975	98	298
Heilbron	Steam	No	250	230	D.C.	Over	50	25	56,821	50	130
Johannesburg ...	Steam & Gas	Yes	500—600 460—480 3,000—3,300	200 & 400 500—600 460—480	D.C. & A.C. 50	Both	13,750	9,700	20,551,894	7,000	12,300
Kalk Bay	Steam	Yes	3,300	190—110	A.C. 50	Both	300	200	—	284	203
*b*Kimberley	Bulk	—	5,000	220	A.C. 50	Both	—	—	838,742	191	1,078
King William's Town	Steam	Yes	2,200	220—225	A.C. 50	Both	200	101	135,374	286	502
Klerksdorp	Gas	—	500	23a & 460	D.C.	Over	70	50	84,000	104	200
Kroonstad	Steam	No	250	230	D.C.	Both	180	120	394,500	115	413
Krugersdorp ...	Steam	Yes	480	460	D.C.	Both	450	340	755,340	315	825
Ladysmith	Steam	No	220	220	D.C.	Over	250	600 amp	269,597	162	240
*d*Newcastle	Steam	No	550	250	D.C.	Over	78	65	2,000	300	175
Oudtshoorn	Oil	—	440—480	220—240	D.C.	Both	180	280	127,127	258	414
Parys...	Water	—	460	230	D.C.	Over	30	40 amp.	—	100	57
Pietermaritzburg ...	Steam	Yes	2,050 & 550	200 & 550	D.C. & A.C. 100	Both	1,550	700	1,492,981	470	1,720
Port Elizabeth ...	Steam	Yes	250	250 & 500	D.C.	Both	1,200	812	—	715	1,688
Potchefstroom ...	Steam	Yes	250 & 500	240 & 480	D.C.	Over	150	65	108,596	120	304
Pretoria	Steam	Yes	550	250 & 500	D.C.	Both	3,300	2,000	4,273,000	1,470	3,500
Queenstown	Oil	—	230 & 460	220 & 440	D.C.	Both	140	230	80,000	240	364
*e*Roodepoort... ...	Bulk	—	3,300	400 & 230	A.C. 50	Over	180	150	96,000	400	479
Salisbury	Oil	—	460	220 & 440	D.C.	Both	200	100	—	103	300
Springs	Bulk	—	—	—	—	—	—	—	—	—	—
*g*Standerton... ...	Steam	No	240	230	D.C.	Over	75	50	—	150	144
Uitenhage	Gas	—	440	220	D.C.	Both	270	—	—	296	180
Wynberg	Bulk	—	3,000	220	A.C. 50	Both	250	150	—	—	318

a Combined electric and water schemes.
b Current purchased in bulk from De Beers Consolidated Mines.
c Electric light and water supplied by Bulawayo Waterworks Co., Ltd.
d Supplied by Messrs. E. H. Gellender & Co., Ltd.
e Current supplied by Victoria Falls & Transvaal Power Co., Ltd.
f Plant installed in March, 1913.
g Current supplied by South African Railways.

TRADE OF CANADA.

A report on the trading position in Canada by H.M. Trade Commissioner has just been issued by the Board of Trade (Cd. 8,270. Price 3d. Wyman & Sons). An extract is given below of such portions of the report as will be of interest to the electrical and allied trades:—

Encouraging Outlook.—Since December, 1914, orders from the Allies to Canadian manufacturers have continually increased, and, as reflected in the trade returns, there resulted a trading balance of exports over imports of over $200,000,000 in favour of the Dominion for the calendar year 1915. To realise the full meaning of this balance, one must remember that, until 1915, Canada had not experienced for many years a balance in her favour on a complete year's trading.

Apart, however, from their intrinsic value, the orders for munitions and equipment have been of great educative value to the Dominion, and now she has a very considerable body of persons skilled in the use of machinery and in the manufacture of many articles which, but for the war, might never have been manufactured in Canada at all. The result, from this point of view alone, bids fair to be of the greatest value to the country in its future industrial development.

For the coming year, 1916, Canada offers an exceptionally strong and tempting market to those firms who are in a position to offer and supply commodities which she is prepared to purchase. In short, as a consequence of greatly increased returns from agriculture, mining, fisheries and industries in 1915, she is now a buyer of greater potential strength than she has been for years past. It is, therefore, all the more regrettable that British manufacturers, who have experienced poor trade during recent years, will be less able than ever to secure a share of her increased orders on account of inability to make deliveries.

Imports of manufactures of metal and machinery from the United Kingdom fell very seriously in 1915. The British position has been weak owing to the competition from the United States, and, for the period under review, as a result of the demands made at home on the United Kingdom manufacturer, a substantial decrease could hardly be avoided. The percentage of imports from the United Kingdom in 1915 (7.7) showed a relative loss of position of 50 per cent. in comparison with 1913 (15.3 per cent.).

Many municipalities will ask their ratepayers early in 1916 to vote upon the question as to whether they will take part in the proposed scheme of electric radio railways in Ontario. The municipalities agreeing to do so will operate the railways and the Ontario Hydro-Electric Commission will supply the power. The coming year should witness something definite in regard to this scheme.

The Ontario Hydro-Electric Commission will probably be for some time to come one of the largest purchasers in this market for motors, copper wire, insulators, sluice gates, generators, and power plant generally, and it would be advisable for the Canadian representatives of United Kingdom firms to keep in close touch with the Commissioner's offices.

Preference and its Effect.—The preferential duties accorded to United Kingdom goods entering Canada may be taken as an expression of the desire of the Canadian Government and people to give some assistance to the United Kingdom manufacturer, and they have actually been of some service in the desired direction. In practice, however, it has been found that the preference has not operated to an extent nearly as much as was anticipated at the time of its introduction.

In the quinquennial period 1901-1905, the average amount of duty per centum on dutiable goods coming from the United Kingdom was less than that on dutiable goods coming from the United States, but for the later periods the United Kingdom goods have paid the greater percentage duty. The explanation is that lower duties are payable on entry into Canada on the articles which form the staple trade of the United States with Canada, than on those articles which form the staple trade of the United Kingdom with the Dominion. For example, the average *ad val.* rate of duty paid on manufactures of iron and steel is about 21 per cent., whereas the average *ad val.* rate of duty paid on manufactures of wool is about 29 per cent.

The operation of the Dumping Clause in the Canadian Tariff is not in sympathy with the preferential duties granted to United Kingdom goods. The Special Duty under this Clause protects only the Canadian home manufacturer.

United Kingdom trade gains little from the preferential rate of duty on the value of packages or coverings, as United States traders rail goods cheaply crated and, on occasion, without any crate or case whatever. It gains nothing from the provision, under the Customs Act, that duties generally shall not be charged on less than the invoice value in the case of goods sold to persons in Canada prior to their importation into Canada. Probably the larger proportion of United Kingdom goods are sold under these conditions. But, while Canadian firms with capital are able to purchase and import direct *as purchasers* (although the goods may actually be sold prior to shipment), and can thus pass the goods through the Customs on "domestic value" without question, whenever a firm acts as "an agent" and sells on commission, the price to the Canadian buyer necessarily includes the "agent's commission," on which duty is also levied.

Branches from the States.—The opening of branch works by the United States manufacturer across the border is a noticeable feature in the industrial life of Canada. The importance of the operations carried on by these branches naturally enough varies considerably, for while some branches are engaged largely in assembling plant, others carry on a genuine manufacturing business, and many manufacture a portion of an article in their Canadian works, and utilise imported parts for completing the article. The latest particulars indicate that the number of United States branch works established, and in operation, in Canada is about 409, of which 329 are situated in Ontario.

The ease with which a branch of a United States works can be established, maintained, and controlled from the parent works is, no doubt, one of the reasons for so many being established in Canada, and avoiding, by so doing, many tariff and transportation problems. It has been advocated that British concerns should act in the same manner, and though one or two have done so, the difficulties are so considerable that it is unlikely that many United Kingdom firms will endeavour to establish branch works in the Dominion. The expenses incidental to (1) ascertaining the probable success of the venture, (2) acquiring a suitable site for a factory, and (3) selecting machinery and equipment suitable to local power conditions and the class of labour available, are infinitely greater to a British concern than to an American; whilst the system used, the class of manufacture, the labour to be employed, and even the management, are all foreign to British ideas and methods. The whole subject, which is apparently so simple and easy to those who have not given close consideration to it, bristles with difficulties.

German Penetration.—German methods of investigating a market challenge comparison with British methods, and the comparison appears to indicate that the science of commercial penetration has not received in the past the same attention in the United Kingdom as in Germany.

One is perfectly familiar with reiterated advice to the British manufacturer to send travellers, and yet more travellers, into the Canadian market, and to publish catalogues in the currency of Canada, but it is clear that such advice is of little service unless accompanied with the necessary information as to the particular articles required by the market, and the communication of this information to those British manufacturers who are in a position to satisfy such requirements. In some such way only is it possible for British firms to judge whether an adequate return for the expense of sending travellers, and compiling catalogues in accordance with Canadian requirements, would ensue.

The German manufacturer appears to have had this advice and has attained a measure of success, as judged by the trade returns. It is clear that the considerable and carefully-trained German Consular service in Canada, coupled with a scientifically-conducted intelligence system in Germany itself, are responsible for the high average results which have been secured by those German manufacturers who have decided to establish export trade relations with the Dominion.

An actual case of the working of the German system will illustrate its efficacy. Two young Germans came to Montreal in the fall of 1912 to introduce a line of goods, and took a small office; neither had been to Canada before, but they had received advice that there would be a market for certain classes of articles. They worked hard for eighteen months, and at the end of that time had built up a considerable and profitable connection. When asked as to the reason of their success, they explained that they had come to Montreal equipped with information as to:—

1. Likely buyers in Montreal, Toronto, and other towns in the neighbourhood.

2. The financial standing of such firms, and the names of men employed by these firms upon whom it was advisable to call.

3. The articles of Canadian or foreign manufacture that they would have to meet in competition, and the prices of such articles. And,

4. The customary terms of credit prevailing.

All this information had been available to them in Germany before they set out for Canada. Moreover, they were guaranteed sufficient living and office expenses, they knew that the principals whom they represented were well posted as to the details of trade, such as the preparing of invoices, declarations, &c., in accordance with the Canadian Customs requirements.

There are no grounds whatever for believing that the average German manufacturer is more intelligently active in obtaining information as to the overseas prospects for his goods than the average British manufacturer, and one is forced to the conclusion that the German Government had a highly efficient organisation for conveying this information to such firms as could turn it to the best advantage.

NEW PATENTS APPLIED FOR, 1916.

(NOT YET PUBLISHED).

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

10,008. "Method of producing high-frequency oscillations." I. Chortik. July 17th.

10,016. "Interrupters or make-and-break devices for magneto ignition in internal-combustion engines." V. Rosso. July 17th.

10,029. "Electric incandescence lamps." J. W. Meek. July 17th.

10,036. "Electrically-driven vibratory apparatus." F. G. Bell & Sterling Telephone and Electric Co., Ltd. July 17th.

10,047. "Mirror reflector to be applied to electrical generating apparatus for inspection purposes." W. E. Line. July 18th.

10,070. "Electric-cable junction or terminal boxes or apparatus." British Insulated and Helsby Cables, Ltd., & C. Vernier. July 18th.

10,072. "Electric fuses or cut-outs." L. Newitt. July 18th.

10,088. "Electric switches." M. Brooks, J. E. Franks, A. E. Read & Walsall Hardware Manufacturing Co. July 18th.

10,096. "Spark-gaps for wireless telegraphy." J. Bethenod & E. Girardeau. July 18th. (France, July 21st, 1915.)

10,099. "Multiple control apparatus for electric railways." Akt.-Ges. Brown, Boveri et Cie. July 18th. (Germany, July 29th, 1915.)

10,100. "Circuit-interrupting devices." British Westinghouse Electric and Manufacturing Co. (Westinghouse Electric and Manufacturing Co.). July 18th.

10,101. "Protective relays for electric circuits." British Westinghouse Electric Manufacturing Co. (Westinghouse Electric Manufacturing Co.). July 18th.

10,103. "Generation of high-frequency currents." I. Chortik. July 18th.

10,116. "Circuit-controllers." Igranic Electric Co. (Cutler-Hammer Manufacturing Co.). July 18th.

10,122. "Oscillating audions." L. de Forest. July 18th. (United States, July 22nd, 1915.)

10,126. "Sparking-plugs for internal-combustion engines." G. St. B. S. Watkins. July 18th.

10,142. "Pendulum indicators for electric-bell systems, etc." I. H. Parsons. July 19th.

10,162. "Electric photographic printing or copying frames." J. Halden & Co. and J. B. Halden. July 19th.

10,174. "Dynamo-electric machines." British Thomson-Houston Co. (General Electric Co.). July 19th.

10,176. "Means for opening and closing electrical circuits." Marconi's Wireless Telegraph Co. & R. H. White. July 19th.

10,178. "Controllers for electric motors." W. B. Bennitt. July 19th.

10,182. "Differentially metering electricity for lighting and heating." L. Birks & J. R. Templin. July 19th. (New Zealand, March 2nd.)

10,183. "Apparatus for electro-deposition of metals." H. R. Braid. July 19th.

10,184. "Insulation for electrical apparatus." E. Haefely et Cie Akt.-Ges. July 19th. (Switzerland, October 20th, 1915.)

10,193. "Electrolytic process for removing sulphide compounds from surfaces of articles of copper or copper alloys." P. Marino. July 19th.

10,227. "Protective devices for alternating-current electric systems." A. E. McColl. July 20th.

10,228. "Method of galvanizing copper to electric non-conducting substances." U. Unno. July 20th.

10,234. "Telephone directory." W. H. Aston. July 20th.

10,257. "Speed indicators and counters." Eastern Telegraph Co. July 20th.

10,272. "Means for cooling sparking-plugs for internal-combustion engines." J. Knight. July 21st.

10,274. "Electrical transformers." Brush Electrical Engineering Co. & P. W. Scholefield. July 21st.

10,282. "Electric motor-driving gear." U. C. Leao. July 21st.

10,297. "Devices for attachment to sparking-plugs for automatically cleaning and cooling sparking points." A. E. Lamkin. July 21st.

10,303. "Telegraph systems." Automatic Telephone Manufacturing Co. & S. R. Smith and R. Woodland. July 21st.

10,335. "Thermionic devices." Western Electric Co. (Western Electric Co.). July 22nd.

10,361. "Means of control for petrol-electric vehicles." P. F. Smith & Tilling-Stevens, Ltd. July 22nd.

PUBLISHED SPECIFICATIONS.

1914.

2,530. Telephone Exchange Systems in which the connections are established through Electro-mechanically controlled Switches. F. Aldenhoff. January 30th.

17,022. Filament Supports for Electric Incandescent Lamps. Julius Pintsch Akt.-Ges. July 17th. (February 11th, 1914.)

17,023. Incandescent Electric Lamp Filaments and the Method of Mounting the same. Julius Pintsch Akt.-Ges. July 17th. (February 16th, 1914.)

1915.

6,486. Wireless Telegraph and Telephone Systems. L. de Forest. April 30th.

9,476. Apparatus for Coiling Wire. British Thomson-Houston Co. (General Electric Co.). June 29th.

9,486. Telegraphic Relays. United Telegraph and Cable Co. and W. M. Bruce, Junr. June 29th.

9,670. Electron-discharge Apparatus and Method of Operating the Same. British Thomson-Houston Co. (General Electric Co.). July 2nd.

9,828. Manufacture of Electric Heating Elements. H. J. Dowsing and D. Huntley. July 6th.